

UNITED STATES DISTRICT COURT
CENTRAL DISTRICT OF CALIFORNIA - WESTERN DIVISION
HONORABLE JOHN A. KRONSTADT
UNITED STATES DISTRICT JUDGE PRESIDING

- - -

USA,)
)
 PLAINTIFF,)
)
 VS.) CR18-00050-JAK
)
 SHIH, ET AL.,)
 DEFENDANTS.)
-----)

REPORTER'S TRANSCRIPT OF TRIAL PROCEEDINGS

DAY 3, VOLUME 1 OF 2

LOS ANGELES, CALIFORNIA

FRIDAY, MAY 17, 2019; 8:30 AM

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1 LOS ANGELES, CALIFORNIA; FRIDAY, MAY 17, 2019

8:30 AM

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6 (THE FOLLOWING PROCEEDINGS WERE HELD IN
7 OPEN COURT OUTSIDE THE PRESENCE OF THE JURY:)

8 THE COURT: IN CR18-00050, USA VERSUS YI-CHI
9 SHIH.

11 MS. HEINZ: GOOD MORNING, YOUR HONOR. JUDITH
12 HEINZ ON BEHALF OF THE UNITED STATES.

13 ALSO WITH US HERE AT COUNSEL TABLE IS
14 SPECIAL AGENT ALEX STORINO.

15 MR. ROLLINS: GOOD MORNING, YOUR HONOR. WILL
16 ROLLINS ON BEHALF OF THE UNITED STATES.

17 MR. SHOBAKI: GOOD MORNING, YOUR HONOR. KHAL
18 SHOBAKI ON BEHALF OF THE UNITED STATES.

19 MR. HUGHES: GOOD MORNING, YOUR HONOR. JAMES
20 HUGHES ON BEHALF OF THE UNITED STATES.

21 MS. SARTORIS: GOOD MORNING, YOUR HONOR.

22 MELANIE SARTORIS ON BEHALF OF THE UNITED STATES.

23 MR. SPERTUS: GOOD MORNING, YOUR HONOR. JAMES
24 SPERTUS, CHRISTA WASSERMAN AND JOHN HANUSZ ON BEHALF OF
25 DR. SHIH WHO IS PRESENT BEFORE THE COURT.

1 THE COURT: GOOD MORNING TO ALL OF YOU.
2 I WANTED TO RAISE TWO QUICK POINTS.
3 FIRST, I UNDERSTAND FROM MS. KEIFER THAT
4 YOU EXPECT TWO WITNESSES TO CONSUME MOST OF THE TIME
5 TODAY AND THAT, IF THERE'S ANOTHER WITNESS AFTER THAT,
6 SOME EVIDENTIARY OBJECTIONS MIGHT NEED TO BE ADDRESSED.

7 IS THAT RIGHT?

8 MS. SARTORIS: CORRECT, YOUR HONOR.

9 THE COURT: YOU AGREE WITH THAT?

10 MR. SPERTUS: I AGREE, YOUR HONOR.

11 THE COURT: WELL, LET'S PLAN ON HAVING THOSE
12 TWO WITNESSES, AND THEN WE CAN DEAL WITH THE OTHER
13 ISSUES.

14 GOOD WORK YESTERDAY. I KNOW YOU WERE
15 WORKING HARD TRYING TO RESOLVE THE OTHER ISSUES AND
16 NARROWING THEM.

17 MR. SPERTUS: I JUST WANTED TO ALERT THE COURT
18 OF THE TWO WITNESSES TODAY, CARLOS MONROY WILL BE THE
19 LONGEST.

20 AND I DON'T WANT THE COURT TO BE
21 IMPATIENT AS WE WALK -- AS A COURTESY, I WANT TO GIVE
22 THE COURT ANTICIPATION -- NOT TO SUGGEST YOU WOULD BE
23 IMPATIENT. BUT SO THE COURT KNOWS, WE WILL BE WALKING
24 THROUGH REGISTRATIONS, SO IT'S GOING TO BE A TEDIOUS
25 DAY.

1 THE COURT: I UNDERSTAND.

2 I THINK THE IMPORTANT THING IS THAT THE
3 QUESTIONS NOT BE CUMULATIVE OF ANY WITNESS.

4 MR. SPERTUS: YES, YOUR HONOR.

5 THE COURT: SECOND, IN YOUR RESPECTIVE OPENING
6 STATEMENTS AND IN THE TESTIMONY SO FAR, WHICH HAS BEEN
7 LIMITED, THERE'S BEEN A MENTION OF A LOT OF NAMES, MANY
8 NAMES. AND I THINK THAT YOU MAY WANT TO CONSIDER
9 CONFERRING AS TO WHETHER YOU WANTED TO MAKE SOME KIND
10 OF A LIST -- ALPHABETICAL LIST OF NAMES WITH SOME
11 DESCRIPTION OF WHO THIS PERSON IS. I'M NOT REQUIRING
12 IT, BUT THAT MAY BE HELPFUL TO THE JURORS AS THEY
13 LISTEN TO THE EVIDENCE.

14 MS. HEINZ: YOUR HONOR, DID YOU CONCEIVE OF A
15 CHART THAT WOULD BE GIVEN TO THE JURORS?

16 THE COURT: IT COULD BE.

17 I'M NOT ORDERING IT. I'M JUST SUGGESTING
18 YOU CONFER ABOUT IT. I'M NOT SUGGESTING THESE BE -- IT
19 COULD BE AN ALPHABETICAL LIST. SO WHEN THE JUROR HEARS
20 A NAME BEING MENTIONED, THE JUROR CAN LOOK AT THE LIST,
21 BECAUSE YOU'VE GOT LOTS OF NAMES.

22 MR. SHOBAKI: ONE ISSUE WITH RESPECT TO THE
23 FIRST WITNESS. WE HAVE A DEMONSTRATIVE EXHIBIT THAT'S
24 NOT OBJECTED TO.

25 IS IT OKAY IF I PUT THOSE SLIDES UP?

1 MR. SPERTUS: NO OBJECTION FROM THE DEFENSE.

2 THE COURT: THAT'S FINE.

3 MR. SHOBAKI: THANK YOU, YOUR HONOR.

4 THE COURT: WHO IS THE NEXT WITNESS?

5 MR. SHOBAKI: CHRISTOPHER NORDQUIST, YOUR
6 HONOR.

7 THE COURT: THANK YOU.

8 **(THE FOLLOWING PROCEEDINGS WERE HELD IN
9 OPEN COURT IN THE PRESENCE OF THE JURY:)**

10 THE CLERK: ALL RISE.

11 THE COURT: PLEASE BE SEATED.

12 ALL 15 JURORS ARE PRESENT, INCLUDING THE
13 ALTERNATES.

14 WELCOME BACK, LADIES AND GENTLEMEN.

15 THANK YOU FOR BEING BACK TODAY.

16 WE'LL BE GOING UNTIL ABOUT 2:30 TODAY.

17 MR. SHOBAKI, WHO IS THE NEXT WITNESS,
18 PLEASE?

19 MR. SHOBAKI: YOUR HONOR, THE UNITED STATES
20 CALLS CHRISTOPHER NORDQUIST.

21 THE CLERK: YOU DO SOLEMNLY SWEAR THAT THE
22 TESTIMONY YOU ARE ABOUT TO GIVE IN THE CAUSE NOW
23 PENDING BEFORE THIS COURT SHALL BE THE TRUTH, THE WHOLE
24 TRUTH, AND NOTHING BUT THE TRUTH, SO HELP YOU GOD?

25 THE WITNESS: YES.

1 THE CLERK: CAN YOU STATE YOUR FULL NAME AND
2 SPELL IT FOR THE RECORD.

3 THE WITNESS: CHRISTOPHER DANIEL NORDQUIST,
4 C-H-R-I-S-T-O-P-H-E-R, D-A-N-I-E-L. LAST NAME,
5 N-O-R-D-Q-U-I-S-T.

6 THE COURT: GOOD MORNING, MR. NORDQUIST.

7 THE WITNESS: GOOD MORNING.

8 THE COURT: PLEASE PROCEED, MR. SHOBAKI.

9 **DIRECT EXAMINATION**

10 BY MR. SHOBAKI:

11 Q GOOD MORNING, DR. NORDQUIST.

12 WHERE DO YOU WORK?

13 A I WORK AT SANDIA NATIONAL LABORATORY.

14 Q HOW LONG HAVE YOU WORKED THERE?

15 A SINCE JANUARY OF 2002, SO A LITTLE MORE THAN 17
16 YEARS.

17 Q WHAT'S YOUR POSITION AT SANDIA?

18 A I'M A DISTINGUISHED MEMBER OF THE TECHNICAL STAFF
19 WORKING IN THE AREA OF MICROWAVE AND CENTERS RESEARCH
20 AND DEVELOPMENT.

21 Q CAN YOU BRIEFLY DESCRIBE YOUR EDUCATIONAL
22 BACKGROUND?

23 A I HAVE A BACHELOR'S DEGREE IN ELECTRONIC
24 ENGINEERING, A MASTER'S DEGREE IN ELECTRICAL
25 ENGINEERING, A PH.D. IN ELECTRICAL ENGINEERING,

1 SPECIALIZING IN MICRO-ELECTRONIC FABRICATION AND
2 DEVICES.

3 ALL OF THOSE DEGREES ARE FROM PENNSYLVANIA
4 STATE UNIVERSITY.

5 Q AS PART OF YOUR WORK, DO YOU WORK IN THE AREA OF
6 MICROWAVE AND RADIO FREQUENCY?

7 A YES.

8 Q AND CAN YOU BRIEFLY DESCRIBE THE KIND OF WORK THAT
9 YOU HAVE DONE IN THOSE AREAS?

10 A SO OUR TEAM DOES ADVANCED TECHNOLOGY DEVELOPMENT
11 FOR WHAT WE SEE AS MERGING APPLICATIONS THAT ARE OF
12 INTEREST TO THE UNITED STATES.

13 Q AND, SPECIFICALLY, DOES THAT INVOLVE MICROWAVES?

14 A YES.

15 Q AND WHAT ABOUT CIRCUIT DESIGNS?

16 A YES, WE PERFORM A NUMBER OF CIRCUIT DESIGNS.

17 Q DOES YOUR GROUP AT SANDIA DEVELOP AND PRODUCE
18 MICROWAVE PRODUCTS?

19 A WE PRODUCE RESEARCH PROTOTYPES IN THE MICROWAVE --
20 FOR MICROWAVE APPLICATIONS.

21 Q DOES THAT INCLUDE DESIGN AND FABRICATION OF THOSE
22 PARTS?

23 A YES.

24 Q AND WHAT TYPES OF TECHNOLOGY DO YOU USE IN TERMS OF
25 THE FABRICATION?

1 A SO WE DO WORK -- OUR TEAM DOES WORK IN A NUMBER OF
2 DIFFERENT TECHNOLOGIES, INCLUDING COMPOUND
3 SEMICONDUCTORS, SUCH AS GALLIUM NITRIDE AND GALLIUM
4 ARSENIDE, AND AS WELL AS SILICON TECHNOLOGIES.

5 MY WORK IS SPECIFICALLY FOCUSED ON -- EARLIER
6 IN MY CAREER ON COMPOUND SEMICONDUCTORS AND, MORE
7 RECENTLY, ON THE RF MEMS, WHICH MEANS MICRO ELECTRICAL
8 MECHANICAL SYSTEM.

9 Q ARE YOU A MEMBER OF ANY PROFESSIONAL ORGANIZATIONS?

10 A I AM A MEMBER OF THE IEEE, WHICH IS THE INSTITUTE
11 OF ELECTRICAL AND ELECTRONICS ENGINEERS.

12 Q AND WHAT'S THAT?

13 A THAT'S A PROFESSIONAL ORGANIZATION THAT HOLDS
14 CONFERENCES, PUBLISHES JOURNALS AND IS THE PRIMARY
15 ORGANIZATION IN OUR FIELD.

16 Q AND DO YOU HAVE ANY ROLES AT THE IEEE?

17 A I AM A REVIEWER FOR JOURNAL ARTICLES. I HAVE BEEN
18 ON COMMITTEES FOR TECHNICAL CONFERENCES. AND I AM
19 CURRENTLY THE CHAIR OF THE TECHNICAL COORDINATION
20 COMMITTEE FOR MICROWAVE MATERIALS AND CONTROLS.

21 Q AND DO YOU HAVE PUBLISHED ARTICLES IN CONFERENCE
22 PUBLICATIONS RELATED TO THE AREAS OF YOUR EXPERTISE?

23 A YES.

24 Q AND DO YOU HOLD ANY PATENTS?

25 A YES.

1 Q WERE YOU ASKED TO ANALYZE AND TEST MMIC'S AS PART
2 OF YOUR WORK IN THIS CASE?

3 A YES.

4 Q WHAT IS A MMIC?

5 A A MMIC IS A MONOLITHIC MICROWAVE INTEGRATED
6 CIRCUIT.

7 Q AND FOR US, DR. NORDQUIST, HAVE YOU PREPARED SOME
8 SLIDES TO HELP WITH YOUR DISCUSSION TODAY?

9 A YES.

10 Q I'LL BE SHOWING THAT SHORTLY.

11 A OKAY.

12 Q ALL RIGHT. CAN YOU, AGAIN, BREAK DOWN WHAT A MMIC
13 IS, PLEASE?

14 A SO "MMIC" IS A SHORT FOR "MONOLITHIC MICROWAVE
15 INTEGRATED CIRCUIT."

16 THE TERM "MONOLITHIC" MEANS THAT ALL OF THE
17 PIECES ARE ON ONE -- ALL OF THE COMPONENTS REQUIRED ARE
18 ON ONE PIECE OF MATERIAL. SO ALL OF THE PARTS THAT WE
19 WOULD NEED ARE BUILT IN ONE MANUFACTURING FLOW ON A
20 CHIP.

21 "MICROWAVE" MEANS IT OPERATES WITHIN A
22 FREQUENCY OF APPROXIMATELY 3 GIGAHERTZ TO 40 GIGAHERTZ.

23 "GIGAHERTZ" MEANS THAT IT'S A ONE BILLION HERTZ OR ONE
24 BILLION CYCLES PER SECOND.

25 AN "INTEGRATED CIRCUIT" IS OFTEN REFERRED

1 TO AS "CHIP" OR A "DIE" OR A "MICROCHIP." AND THAT
2 MEANS THAT IT HAS -- ALL THE PARTS ARE INTERCONNECTED
3 TO PERFORM A SPECIFIC DESIGN FUNCTION. THIS ALLOWS US
4 TO MAKE THE CIRCUIT SMALLER AND TO BETTER CONTROL THE
5 INTERFACES BETWEEN THE DIFFERENT DEVICES.

6 Q AND CAN YOU EXPLAIN WHAT A TRANSISTOR IS?

7 A A TRANSISTOR IS THE DEVICE THAT IS THE ACTIVE PART
8 OF THE MMIC. YOU CAN THINK OF THAT AS THE ENGINE.
9 THIS IS THE DEVICE THAT CONTROLS THE MICROWAVE ENERGY
10 OR PRODUCES A MICROWAVE ENERGY.

11 IN THE PICTURE BEFORE YOU, IT IS THESE
12 GREENISH-LOOKING VERTICAL ROW OF ITEMS, ONE OF WHICH IS
13 CIRCLED IN THE CENTER.

14 Q IS THAT PICTURE A PICTURE OF A MMIC?

15 A YES, IT IS.

16 Q AND WHAT IS HEMT?

17 A A HEMT IS ANOTHER SHORT-TERM FOR WHAT'S CALLED A
18 "HIGH ELECTRON MOBILITY TRANSISTOR." THAT IS A
19 SPECIFIC TYPE OF TRANSISTOR THAT IS USED FOR MICROWAVE
20 APPLICATIONS.

21 Q IN CONNECTION WITH THIS CASE, DID YOU REVIEW AND
22 ANALYZE SPECIFIC WAFERS AND MMIC'S?

23 A YES.

24 Q AND WHAT WAS THAT?

25 A THERE WAS WAFERS WERE GALLIUM NITRIDE MMIC'S ON A

1 SILICON CARBIDE SUBSTRATE.

2 THIS IS A PICTURE OF ONE OF THOSE.

3 Q AND DO YOU KNOW WHERE THE -- BASED ON YOUR REVIEW
4 OF DOCUMENTS, DO YOU KNOW WHERE THOSE MMIC'S WERE
5 MANUFACTURED?

6 A THOSE MMIC'S WERE MANUFACTURED AT A COMPANY KNOWN
7 AS "CREE," WHICH HAS RECENTLY CHANGED ITS NAME OR IS
8 ALSO KNOWN AS "WOLFSPEED."

9 Q AND WHAT IS A "FOUNDRY"?

10 A A "FOUNDRY" IS A COMPANY THAT MANUFACTURES
11 INTEGRATED CIRCUITS ACCORDING TO DESIGNS AND
12 SPECIFICATIONS PROVIDED BY DESIGNERS.

13 Q SO A FOUNDRY IS A PLACE WHERE MMIC'S WOULD BE
14 MANUFACTURED?

15 A YES.

16 Q SPECIFICALLY WHAT KIND OF MMIC'S OF CIRCUITS WERE
17 THE MMIC'S THAT YOU TESTED IN THIS CASE?

18 A THESE MMIC'S ARE POWER AMPLIFIERS.

19 Q WERE THE MMIC POWER AMPLIFIERS AT ISSUE HERE CUSTOM
20 DESIGNED?

21 A YES.

22 Q CAN YOU DESCRIBE THE DESIGN PROCESS FOR MAKING A
23 MMIC?

24 A YES.

25 SO THE FOUNDRY HAS A BASE TECHNOLOGY. THAT

1 INCLUDES ALL OF THE COMPONENTS AND THE PARTS YOU WOULD
2 NEED TO MAKE YOUR CIRCUIT. THEY PROVIDE TO A DESIGNER
3 WHAT IS CALLED A "DESIGN KIT." THAT KIT IS A COMPUTER
4 FILE THAT HAS THE ELECTRONIC REPRESENTATIONS OF THE
5 DEVICES, AS WELL AS FILES THAT REPRESENT THE
6 PERFORMANCE OF THE DEVICES.

7 THE DESIGNER TAKES THOSE -- TAKES THAT FILE.
8 AND USING A COMPUTER-AIDED DESIGN SOFTWARE, WOULD
9 ARRANGE THE COMPONENTS IN THE WAY THAT THEY WOULD WANT
10 THEM TO BE ARRANGED FOR THEIR SPECIFIC DESIGN AND
11 SPECIFICATION. THE COMPUTER-AIDED DESIGN SOFTWARE CAN
12 RUN SIMULATIONS SO YOU COULD PREDICT THE PERFORMANCE OF
13 YOUR INTEGRATED CIRCUIT.

14 ONCE THE DESIGNER IS SATISFIED WITH THE
15 DESIGN, THEY THEN LAY IT OUT, WHICH MEANS THEY BUILD A
16 REPRESENTATION THAT IS -- THAT IS WHAT YOU'RE ACTUALLY
17 TRYING TO BUILD.

18 SO YOU CAN THINK OF THIS AS, THE FOUNDRY IS
19 PROVIDING YOU WITH THE PARTS TO BUILD IT. AND THEN
20 YOU'RE TELLING THE FOUNDRY WHERE TO PUT THEM AND HOW TO
21 CONNECT IT.

22 AS AN ANALOGY, YOU CONTRACT TO BUILD A CUSTOM
23 HOME. THE BUILDER MIGHT HAVE BATHROOMS AND KITCHENS
24 AND CLOSETS AND THINGS LIKE THAT YOU WOULD THEN GO AND
25 TELL THEM HOW TO LAY THAT OUT TO GET THE HOME YOU

1 WANTED.

2 SO A DESIGNER TAKES THE DIFFERENT COMPONENTS
3 AND ARRANGES THEM TO GET THE PERFORMANCE THEY WANT AND
4 USES THE SOFTWARE TO PREDICT THAT.

5 AFTER THAT PART IS DONE, YOU HAVE A DESIGN
6 FILE, WHICH APPEARS -- THERE'S A SCREEN SHOT OF ONE
7 HERE, THE BLUE OUTLINE. THAT IS THE DESIGN FILE THAT
8 WAS THEN USED TO MAKE THE INTEGRATED CIRCUIT ACCORDING
9 TO THE SPECIFICATIONS.

10 Q YOU MENTIONED "SIMULATIONS," CAN YOU EXPLAIN WHAT
11 THAT IS?

12 A SO THE SIMULATIONS TAKE THE ELECTRONIC
13 REPRESENTATION OF THE COMPONENTS THAT THE FOUNDRY HAS.
14 AND YOU CAN PUT THEM TOGETHER, AND MODEL OR BASICALLY
15 RUN AN ELECTRONIC SIMULATION THAT WOULD HAVE A
16 PERFORMANCE -- THAT HAS A PERFORMANCE SIMILAR TO THE
17 CIRCUIT YOU'RE LOOKING TO BUILD, AND IS A WAY TO
18 PREDICT WHAT YOU'RE ACTUALLY BUILDING AND VERIFY YOUR
19 DESIGN.

20 Q AND WHY, IN THE MMIC POWER AMPLIFIER PROCESS, WOULD
21 YOU DO SIMULATIONS?

22 A THE RUNS ARE GENERALLY VERY EXPENSIVE AND TAKE A
23 RELATIVELY LONG TIME, SEVERAL MONTHS. AND SO YOU DON'T
24 WANT TO -- THEY HAVE TO BE RIGHT IN ORDER TO AVOID
25 SPENDING MONEY OR WASTING TIME ON DESIGNS THAT DON'T

1 PERFORM THE INTENDED FUNCTION.

2 Q SO IS THAT A WAY OF TESTING IT BEFORE YOU BUILD?

3 A YES.

4 Q NOW, YOU MENTIONED CREATING THIS KIND OF A LAYOUT
5 OF WHAT THE MMIC POWER AMPLIFIER WOULD LOOK LIKE.

6 IS THERE A SPECIFIC FORMAT THAT'S USED FOR
7 DOING THAT?

8 A THE STANDARD FILE FORMAT IS GDS.

9 Q AND IN CONNECTION WITH YOUR WORK, DID YOU REVIEW A
10 GDS DESIGN FILE FOR THE MMIC POWER AMPLIFIER ON THE
11 CREE WAFER THAT YOU LOOKED AT?

12 A YES.

13 Q HOW DID YOU LOOK AT THAT FILE?

14 A WE OPENED THAT FILE USING A SOFTWARE THAT IS USED
15 FOR THE DESIGN AND THE DRAWING OF THESE TYPES OF FILES.

16 Q IS THAT A SPECIAL PROGRAM THAT CAN OPEN THESE KINDS
17 OF FILES AND DISPLAY THEM ON A COMPUTER?

18 A YES.

19 Q AND WHEN YOU WERE EXAMINING THAT GDS FILE, DID YOU
20 TAKE SOME SCREEN SHOTS?

21 A YES.

22 Q AND ARE THOSE A REPRESENTATION OF WHAT THE GDS FILE
23 HAD IN TERMS OF THE LAYOUT?

24 A YES.

25 Q CAN YOU TAKE A LOOK IN THE BINDERS THAT ARE TO YOUR

1 LEFT AND FIND EXHIBIT 1636, PLEASE?

2 A OKAY.

3 Q CAN YOU TAKE A LOOK AT THAT?

4 A YES.

5 Q DO YOU RECOGNIZE EXHIBIT 1636?

6 A YES.

7 Q HOW DO YOU RECOGNIZE IT?

8 A THESE ARE THE SCREEN SHOTS THAT I TOOK FROM THE
9 DESIGN FILE THAT WAS PROVIDED.

10 Q AND DO THOSE SCREEN SHOTS ACCURATELY REFLECT THE
11 CONTENTS OF THE DESIGN FILE?

12 A YES.

13 MR. SHOBAKI: YOUR HONOR, SEEK TO ADMIT
14 EXHIBIT 1636.

15 MR. HANUSZ: NO OBJECTION, YOUR HONOR.

16 THE COURT: EXHIBIT 1636 IS ADMITTED.

17 MR. SHOBAKI: PERMISSION TO PUBLISH?

18 THE COURT: YOU MAY PUBLISH.

19 **(EXHIBIT 1636 RECEIVED IN EVIDENCE)**

20 BY MR. SHOBAKI:

21 Q TAKING A LOOK AT THE SCREEN IN FRONT OF YOU,
22 THE FIRST PAGE, CAN YOU EXPLAIN JUST BRIEFLY WHAT THAT
23 IS?

24 A THIS IS ONE OF THE TWO RETICLES THAT ARE INCLUDED
25 IN THE MASK SET. THIS INCLUDES THE FOUR INTEGRATED

1 CIRCUITS. YOU CAN SEE HOW THEY ARE DELINEATED BY EMPTY
2 SPACE. THERE'S NINE INTEGRATED CIRCUITS ON THIS MASK
3 LAYOUT. AND EACH ONE IS DESIGNED FOR A -- SPECIFICALLY
4 DESIGNED AND AGGREGATED FOR MANUFACTURING ON TO A
5 SINGLE -- INTO A SINGLE DESIGN.

6 THE COURT: MR. NORDQUIST, IF YOU TOUCH THE
7 SCREEN, YOU CAN ANNOTATE IT.

8 BY MR. SHOBAKI:

9 Q YOU SAID THE WORD "RETICLE." CAN YOU EXPLAIN WHAT
10 A RETICLE IS?

11 A A RETICLE IS THE PIECE OF GLASS THAT IS USED TO DO
12 THE IMAGING TO ACTUALLY MANUFACTURE THE CIRCUITS.

13 SO THE WAY THAT IT IS DONE IS, THAT THE
14 INTEGRATED CIRCUITS ARE COLLECTED ON THIS RETICLE. AND
15 THIS RETICLE IS THE PATTERN THAT IS REPEATED LIKE A
16 STAMPING ACROSS THE WAFER TO --

17 THE COURT: IS THE WORD YOU USED "RETICLE"?

18 THE WITNESS: R-E-T-I-C-L-E.

19 THE COURT: THANK YOU.

20 BY MR. SHOBAKI:

21 Q IS THAT A SET OF DESIGNS THAT ARE REPLICATED DURING
22 A MANUFACTURING PROCESS?

23 A YES.

24 Q AND IS PAGE 1 OF EXHIBIT 1636 A RETICLE THAT
25 RELATES TO THE CREE WAFER THAT YOU EXAMINED?

1 A YES.

2 Q AND WAS THIS RETICLE REPRODUCED ON THE CREE WAFER?

3 A YES.

4 Q YOU SAID THAT THERE WERE NINE INTEGRATED CIRCUITS
5 ON HERE?

6 A YES.

7 Q AND ARE THOSE ALL MMIC POWER AMPLIFIERS?

8 A YES, THEY ARE.

9 Q NOW, LOOKING AT THE DESIGN FOR THESE MMIC POWER
10 AMPLIFIERS.

11 IS IT POSSIBLE TO ESTIMATE THE POWER OUTPUT OF
12 A MMIC BASED ON THE DESIGN?

13 A YES. SO WE CAN LOOK AT THE ONE ON THE UPPER LEFT,
14 FOR EXAMPLE. AND WE CAN SEE -- I'M GOING TO CIRCLE,
15 USING THIS SCREEN, THE OUTPUT STAGES FOR THE
16 TRANSISTORS. AND THERE IS A CERTAIN SIZE OF
17 TRANSISTORS THERE THAT WE CAN REVIEW AND DETERMINE HOW
18 LARGE THEY ARE, HOW MANY THERE ARE. AND USING THE RULE
19 OF THUMB OF BETWEEN 3 AND 5 WATTS PER MILLIMETER, WE
20 CAN ESTIMATE WHAT THE OUTPUT POWER OF THOSE POWER
21 AMPLIFIERS WILL BE.

22 Q SO BASED ON THE SIZE OF THE TRANSISTORS AND GATES,
23 YOU CAN ESTIMATE THE POWER?

24 A YES.

25 Q AND IS THAT SOMETHING THAT AN EXPERIENCED MMIC

1 POWER AMPLIFIER DESIGNER WOULD KNOW?

2 A YES.

3 Q CAN YOU ALSO ESTIMATE THE APPROXIMATE FREQUENCY OF
4 WHAT A MMIC POWER AMPLIFIER WOULD BE?

5 A YES. WE CAN ESTIMATE THAT THESE ARE MICROWAVE
6 INTEGRATED CIRCUITS BASED ON THE SIZE OF SOME OF THESE
7 TRANSMISSION LINES AND MATCHING NETWORKS. LIKE THIS,
8 FOR EXAMPLE, AND THOSE ARE GOING TO BE ON THE ORDER OF
9 A FRACTION OF A WAVE LENGTH LONG TYPICALLY.

10 Q SO YOU CAN ESTIMATE THAT BASED ON THE PROPERTIES OF
11 MICROWAVES?

12 A YES.

13 Q NOW, ONCE A DESIGN IS FINALIZED, IS THE -- HOW --
14 HOW ARE MMIC'S ACTUALLY MANUFACTURED?

15 A I ASSUME WE'RE WAITING FOR THE NEXT SLIDE?

16 Q TECHNICAL ISSUES.

17 NOW, ONCE A DESIGN IS FINALIZED, HOW ARE THE
18 MMIC'S ACTUALLY MANUFACTURED?

19 A SO THE MANUFACTURING PROCESS STARTS OFF WITH WHAT
20 IS CALLED A "WAFER." AND THIS IS A DISC OF MATERIAL.
21 IN THIS CASE, THEY ARE FOUR INCHES ROUND MADE OF
22 SILICON CARBIDE, BUT OTHER TECHNOLOGIES USE OTHER
23 MATERIALS.

24 THE FIRST STEP WITH THIS WAFER IS TO GROW IT
25 ON A FILM THAT DEFINES AND IS USED TO MAKE THE ACTUAL

1 TRANSISTORS. AND THAT'S A PROCESS KNOWN AS EPITAXY.
2 THAT'S ON A VERY THIN FILM VERY, THIN PRECISE FILM OF
3 MATERIAL THAT THEN IS USED TO MAKE THE INTEGRATED
4 CIRCUIT.

5 AFTER WE HAVE THE INTEGRATED CIRCUIT AND
6 THE -- AFTER WE HAVE THE EPITAXY ON THE WAFER, IT GOES
7 THROUGH WHAT'S CALLED THE "FABRICATION RUN" OR
8 "PROCESSING RUN." AND THAT IS WHEN THE PATTERN THAT WE
9 TALKED ABOUT ON THE RETICLE IS REPEATED ACROSS THE
10 WAFER MANY TIMES.

11 AND SO THERE'S A NUMBER OF DIFFERENT LAYERS
12 THAT ARE MANUFACTURED ONE AT A TIME WHERE THEY ARE
13 PATTERNED. AND THEN THE MANUFACTURING PROCESS, WHETHER
14 IT'S ETCHED OR SOMETHING OF THAT SORT IS DONE. AND
15 THAT IS REPEATED MULTIPLE TIMES UNTIL, FINALLY, WE HAVE
16 A COMPLETED WAFER.

17 AND THIS HAPPENS TO THE WAFER AS IT'S INTACT
18 AS A FOUR-INCH DISC.

19 AFTER ALL OF THE HANDLING IS COMPLETED AS A
20 DISC, IT IS STUCK TO A STICKY TAPE, SIMILAR TO SAME
21 KIND OF CONSISTENCY AS MAYBE PACKING TAPE. AND IT'S ON
22 LIKE A HOOP RING. THE WAFER IS THEN SAWED UP INTO
23 INDIVIDUAL INTEGRATED CIRCUITS IN THE WAY YOU WOULD SAW
24 UP A PIECE OF WOOD WITH A TABLE SAW, FOR EXAMPLE.

25 AND YOU CAN SEE IN THIS PICTURE ON THE RIGHT,

1 YOU CAN SEE THE LINES -- HORIZONTAL AND VERTICAL LINES
2 ON THE WAFER WHERE IT'S BEEN SAWED INTO INDIVIDUAL
3 CHIPS. AND THOSE INDIVIDUALS CHIP ARE YOUR POWER
4 AMPLIFIERS.

5 THE OTHER TERM FOR THAT IS CALLED "DICING."

6 Q SO PREVIOUSLY WHEN WE WERE TALKING ABOUT THE
7 DESIGN, THE GDS DESIGN, THERE WERE KINDS OF LINES IN
8 BETWEEN THE MMIC POWER AMPLIFIER.

9 DO YOU REMEMBER THAT?

10 A YES.

11 Q ARE THEY SAWED ALONG THOSE LINES?

12 A YES.

13 Q NOW, YOU MENTIONED THAT THIS MMIC THAT WE'RE
14 TALKING ABOUT HERE INVOLVED SILICON CARBIDE TECHNOLOGY?

15 A YES.

16 Q AND WHAT IS THE RELEVANCE OF SILICON CARBIDE?

17 A SO SILICON CARBIDE IS USED AS THE STARTING
18 SUBSTRATE OR WAFER MATERIAL PRIMARILY FOR TWO REASONS.
19 ONE IS THAT, WE CAN GROW A VERY PRECISE FILM OF GALLIUM
20 NITRADE OR GAN.

21 THE OTHER REASON THAT SILICON CARBIDE IS
22 ATTRACTIVE IS BECAUSE IT HAS VERY GOOD THERMAL
23 CONDUCTIVITY. AND IN ELECTRONICS, THERMAL MANAGEMENT
24 OF HEAT CONDUCTIVITY IS VERY IMPORTANT. SO SILICON
25 CARBIDE IS FAVORABLE FOR THERMAL CONDUCTIVITY AS WELL.

1 Q SO YOU MENTIONED GALLIUM NITRADE OR GAN TECHNOLOGY.

2 WHY IS GAN A TECHNOLOGY THAT IS USED FOR MMIC
3 POWER AMPLIFIERS?

4 A GAN HAS -- THE PROPERTIES OF GALLIUM NITRADE --

5 THE COURT: YOU NEED TO SLOW DOWN, PLEASE.

6 THE WITNESS: THE PROPERTIES OF GALLIUM
7 NITRADE ALLOW IT TO BE USED FOR HIGH-POWERED DENSITY
8 AND HIGH POWER. SO THE ELECTRONS THAT MOVE THROUGH THE
9 MATERIAL MOVE QUICKLY. AND IT CAN HANDLE
10 HYPER-VOLTAGES. SO IT IS THE TECHNOLOGY OF CHOICE FOR
11 HIGH POWER OR RF MICROWAVE APPLICATIONS.

12 Q NOW, YOU MENTIONED A "FABRICATION RUN" EARLIER.

13 ARE YOU FAMILIAR WITH A TERM "TAPE OUT"?

14 A YES. "TAPE OUT" IS THE TIME WHEN THE DESIGNER HAS
15 A COMPLETED DESIGN FILE IN THE FORMAT OF GDS. AND THEY
16 SUBMIT IT TO THE FOUNDRY FOR MANUFACTURING.

17 Q SO THAT'S WHEN THE PLANS ARE FINALIZED AND THEY GO
18 OUT TO BE BUILT?

19 A YES.

20 Q SO TALKING ABOUT THE LAYOUT OF THE CREE WAFER,
21 WHICH IS EXHIBIT 1 HERE, CAN YOU EXPLAIN WHAT WAS
22 CONTAINED ON EACH WAFER MANUFACTURED BY CREE DURING THE
23 PRODUCTION RUN THAT CREATED THIS WAFER?

24 A SO THIS IS A -- THE PICTURE ON THE RIGHT IS THE
25 PICTURE OF THE WAFER.

1 THE PICTURE ON THE LEFT IS THE SCREEN SHOT OF
2 THE RETICLE THAT CONTAINS THE NINE POWER AMPLIFIER
3 MMIC'S THAT WERE DESIGNED ON THE RETICLE. THAT RETICLE
4 IS REPEATED ACROSS THE WAFER.

5 AND SO YOU SEE WHERE I DREW THIS RED SQUARE
6 WITH THE "1" ON IT RIGHT HERE (INDICATING). AND THAT
7 IS ONE INSTANCE OF THAT RETICLE. THAT RETICLE IS THEN
8 REPEATED AGAIN AND AGAIN. SO YOU START PUTTING LITTLE
9 DOTS HERE. THAT RETICLE NUMBER 1 APPEARS ON ALL THESE
10 LOCATIONS FOR A TOTAL OF 80 TIMES ACROSS THE WAFER.

11 THERE'S ALSO A SECOND RETICLE. THAT'S RETICLE
12 2. THAT INCLUDED TEST STRUCTURES AND A COUPLE OF OTHER
13 SMALLER POWER AMPLIFIERS. AND THAT WAS REPEATED IN A
14 ROW ACROSS THE WAFER HERE (INDICATING), AND AS WELL AS
15 ACROSS THE WAFER HERE (INDICATING), I BELIEVE IT WAS.

16 AND SO THOSE WERE PREPARED ACROSS THE WAFER.
17 MEANING THAT, FOR EXAMPLE, THIS CIRCUIT HERE
18 (INDICATING), APPEARS IN THE BOTTOM LEFT-HAND CORNER OF
19 EACH INSTANCE OF RETICLE 1. AND YOU WILL SEE MMIC'S
20 ADDRESSED -- OR REFERRED TO BY WHICH ROW AND WHICH
21 COLUMN THEY CAME FROM. AND THAT'S WHAT THAT DESCRIBES.

22 Q IS THAT LIKE IN BINGO OR IN A THOMAS GUIDE, A GRID?

23 A YES.

24 Q OKAY. NOW, YOU SAID THERE WERE 80 COPIES OF
25 RETICLE 1 ON THIS WAFER?

1 A YES.

2 Q AND DOES THAT MEAN THAT THERE WERE 80 COPIES OF
3 EACH OF THE MMIC POWER AMPLIFIERS IN RETICLE 1?

4 A YES.

5 Q AND IN ADDITION TO THE TWO RETICLES THAT WERE BUILT
6 ONTO THE WAFER, ARE OTHER PARTS BUILT ONTO THE WAFER?

7 A YES. THERE ARE SITES REFERRED TO AS "PCM'S," WHICH
8 MEAN "PROCESS CONTROL MONITORS." THERE ARE A TOTAL
9 OF -- I NEED TO COUNT THEM HERE -- 16 OF THOSE ON THIS
10 WAFER.

11 THOSE ARE TEST STRUCTURES THAT ARE PUT THERE
12 BY THE FOUNDRY. AND THOSE ARE DESIGNED TO BE THE SAME
13 STRUCTURE ON EVERY SINGLE WAFER THAT THEY MAKE SO THAT
14 THEY CAN COMPARE -- THEY COULD DO QUALITY CONTROL FROM
15 ONE WAFER TO THE NEXT, FROM ONE LOT TO THE NEXT,
16 REGARDLESS OF WHO THE CUSTOMER IS AND WHAT THEIR
17 DESIGNS ARE. THE FOUNDRY PUTS THOSE PCM'S ON EVERY
18 SINGLE WAFER THEY MAKE SO THEY MAKE SURE THEIR PRODUCT
19 IS WHAT THEY EXPECT IT TO BE.

20 Q SO THE PCM'S, WOULD THOSE BE DESIGNED BY THE PERSON
21 WHO SUBMITTED THE GDS FILE OR WOULD THEY BE DESIGNED BY
22 CREE?

23 A THEY'RE DESIGNED BY CREE.

24 Q NOW, WE TALKED ABOUT MICROWAVES BEFORE.

25 CAN YOU EXPLAIN TO THE JURY WHAT A "MICROWAVE"

1 IS?

2 A I CAN. BUT, FIRST, HOW DO WE GET RID OF THE
3 DRAWINGS?

4 OKAY. SO MICROWAVE ENERGY IS ENERGY THAT IS
5 PART OF THE ELECTROMAGNETIC SPECTRUM. MICROMAGNETIC
6 ENERGY IS ENERGY THAT TRAVELS THROUGH SPACE AND CAN
7 TRAVEL OVER LONG DISTANCES. THE MOST FAMILIAR FORM OF
8 ELECTROMAGNETIC ENERGY IS LIGHT. THE SUN IS MILLIONS
9 OF MILES AWAY, BUT WE CAN SEE THE LIGHT FROM THE SUN.
10 THE LIGHT HEATS ARE SKIN, HEATS OUR EARTH. AND SO THAT
11 ENERGY IS TRAVELING ACROSS SPACE AND GETTING TO US.

12 MICROWAVE -- AND THE WAVE LENGTH OF THAT,
13 FOR REFERENCE, IS ABOUT ONE-HALF OF ONE MILLIONTH OF A
14 METER.

15 MICROWAVE ENERGY IS AT A DIFFERENT WAVE
16 LENGTH. SO ELECTROMAGNETIC WAVES ARE TRAVELING WAVES
17 THROUGH SPACE. AND WE CAN THINK OF THEM, TO USE AN
18 ANALOGY THAT MOST PEOPLE WOULD BE FAMILIAR WITH, AS
19 WAVES OF THE OCEAN. SO A WAVE TRAVELS ACROSS THE
20 OCEAN. IT HAS PEAKS AND VALLEYS. AND THESE PEAKS AND
21 VALLEYS ARE -- TWO PEAKS ARE A CERTAIN DISTANCE APART
22 ON A WAVE. AND THAT'S REFERRED TO AS A "WAVE LENGTH."
23 AND WHEN THOSE WAVES CRASH INTO THE BEACH, THEY HIT THE
24 BEACH AT A CERTAIN NUMBER OF WAVES AT THE BEACH WITHIN
25 A CERTAIN AMOUNT OF TIME. AND THAT'S REFERRED TO AS

1 " FREQUENCY . "

2 SO IN THE MICROWAVE CASE, THE WAVELENGTH
3 AND FREQUENCY ARE INVERSELY PROPORTIONAL, WHICH MEANS
4 THAT WHEN WE HAVE A LONGER WAVELENGTH, YOU HAVE A LOWER
5 FREQUENCY. AND WHEN WE HAVE A SHORTER WAVELENGTH, WE
6 HAVE A HIGHER FREQUENCY. JUST LIKE IF YOU HAVE TWO
7 WAVES OF WATER, IF THEY'RE FAR APART, THEY'RE GOING TO
8 HIT THE BEACH LESS FREQUENTLY. IF THEY'RE CLOSE
9 TOGETHER, THEY'LL HIT THE BEACH MORE FREQUENTLY.

10 SO IN THE MICROWAVE PART OF THE SPECTRUM,
11 THE WAVELENGTH IS APPROXIMATELY ONE INCH AT 12
12 GIGAHERTZ. AND SO ON THIS SCALE HERE, THE RF AND
13 MICROWAVE IN THIS SECTION HERE WHERE WE'RE GOING FROM
14 ABOUT ONE GIGAHERTZ OR ONE-BILLION CYCLES PER SECOND UP
15 TO, LIKE I SAID BEFORE, 20 GIGAHERTZ, EVEN IN THE UPPER
16 RANGE IS -- IS NOT WELL DEFINED IN SOME CASES. AND
17 THAT CORRESPONDS TO A WAVELENGTH OF ABOUT ONE INCH AT
18 12 GIGAHERTZ.

19 Q TELEVISIONS AND RADIOS, ARE THOSE ALSO A TYPE OF
20 ELECTROMAGNETIC RADIATION?

21 A YES.

22 Q NOW, IS THE MICROWAVE SPECTRUM ORGANIZED OR
23 SUBORGANIZED INTO DIFFERENT PARTS?

24 A YES.

25 Q AND CAN YOU -- FIRST OF ALL, CAN YOU TALK ABOUT

1 WHAT USES THERE ARE FOR MICROWAVES?

2 A SO THE USE OF -- MOST OF THE PEOPLE IN THIS ROOM
3 ARE GOING TO THINK OF A MICROWAVE AS A MICROWAVE OVEN.
4 AND THAT IS ONE RELATIVELY NARROW USE OF MICROWAVES
5 WHERE YOU'RE USING MICROWAVE ENERGY GENERATED INSIDE
6 THE OVEN TO --

7 THE COURT: YOU HAVE TO SLOW DOWN.

8 THE WITNESS: THE MICROWAVE ENERGY IS
9 GENERATED INSIDE OF THE OVEN. AND THE FOOD ABSORBS
10 THAT MICROWAVE ENERGY. AND THE FOOD IS HEATED. SO
11 THAT'S A VERY SPECIFIC FREQUENCY AND A VERY SPECIFIC
12 APPLICATION OF MICROWAVES.

13 THE OTHER PLACES WHERE YOU SEE MICROWAVES
14 BEING USED ARE IN COMMUNICATIONS. SO YOU CAN USE
15 MICROWAVE SIGNALS TO TRANSMIT DATA OR VOICE ACROSS LONG
16 DISTANCES, EITHER GROUND-TO-GROUND OR GROUND-TO-SPACE
17 OR AIR-TO-AIR. ANY TWO PLACES YOU CAN HAVE TWO PEOPLE
18 THAT WANT TO TALK TO EACH OTHER OR TRANSMIT DATA, YOU
19 CAN USE MICROWAVES.

20 IT IS ALSO USED VERY EXTENSIVELY IN WHAT
21 I'LL REFER TO GENERALLY AS "SENSING AND DETECTION."
22 RADAR IS THE BEST EXAMPLE OF SENSING WHERE MICROWAVE
23 ENERGY IS SENT OUT. AND THEN REFLECTION IS USED TO
24 DETERMINE WHERE AN OBJECT IS OR HOW FAST THAT OBJECT
25 MAY BE MOVING WITH REGARD TO THE SIZE OF THE OBJECT.

1 THE OTHER CASE WHERE MICROWAVE SIGNALS
2 ARE USED IS IN WHAT WE'LL CALL "SENSING THE FREQUENCY
3 ENVIRONMENT." SO, FOR EXAMPLE, IN THIS ROOM, IF WE
4 WANTED TO KNOW HOW MANY CELL PHONES WERE IN THIS
5 COURTROOM, HOW MANY WIFI COMPUTERS WERE IN THIS ROOM,
6 HOW MANY BLUETOOTH SIGNALS ARE IN THIS COURTROOM, WE
7 COULD SET UP A SENSING NETWORK THAT DETECTED HOW MANY
8 THERE ARE, WHAT FREQUENCY IT WAS USING.

9 AND WHILE IN AN EVERYDAY ENVIRONMENT
10 THAT'S NOT INTERESTING, IN THE -- IN THE BATTLEFIELD
11 SPACE WHERE ELECTRONIC SIGNALS ARE EVERYWHERE, AND
12 YOU -- WHERE PEOPLE ARE USING ELECTRONICS, YOUR
13 ADVERSARIES ARE USING ELECTRONICS, YOU NEED TO KNOW
14 EVERYTHING THAT'S GOING ON SO THAT YOU CAN BE AWARE OF
15 WHO IS OUT THERE AND WHAT THEY'RE DOING.

16 THE FLIP SIDE OF THAT IS, WHAT'S CALLED
17 "ELECTRONIC WARFARE." AND WE HAVE SEEN THE MOVIES
18 WHERE THE PILOT IS FLYING, AND THEY GET A WARNING THAT
19 A MISSILE HAS BEEN FIRED AT HIM. AND THAT'S BECAUSE
20 THE ELECTRONIC WARFARE SYSTEM HAS RECOGNIZED A SIGNAL
21 FROM A MISSILE THAT IS TRACKING THE AIRCRAFT. AND THE
22 PILOT KNOWS HE'S IN DANGER, AND HE HAS TO DO SOMETHING
23 ABOUT IT. AND SO THEY HAVE THE OPTION OF MAYBE FLY THE
24 PLANE DIFFERENTLY. THERE'S ALSO COUNTER-MEASURES WHERE
25 THAT MISSILE CAN BE -- A SIGNAL CAN BE SENT OUT TO

1 CONFUSE THE MISSILE TO TAKE AWAY THE ABILITY FOR IT TO
2 TRACK.

3 AND SO THERE'S A LARGE SPACE IN THE
4 ELECTRONIC BATTLEFIELD WHERE THESE TYPES OF SIGNALS ARE
5 USED TO BOTH -- BOTH TO THE BENEFIT OF YOUR FORCES, AS
6 WELL AS TRYING TO TAKE AWAY THE ABILITY OF THE OTHER
7 FORCES TO USE IT.

8 BY MR. SHOBAKI:

9 Q NOW, WITH RESPECT TO YOUR WORK IN THIS CASE, DID
10 THAT INVOLVE -- DID THE MMIC POWER AMPLIFIER THAT YOU
11 LOOKED AT INVOLVE SPECIFIC PORTIONS OF THE MICROWAVE
12 SPECTRUM?

13 A YES. THESE AMPLIFIERS WERE OPTIMIZED FOR WHAT IS
14 KNOWN AS X-BAND AND KU-BAND.

15 Q AND ARE THOSE BANDS, X AND KU, USED FOR SOME OF THE
16 APPLICATIONS YOU TALKED ABOUT JUST NOW?

17 A YES.

18 Q AND WHY ARE X AND KU-BANDS USEFUL BANDS?

19 A THEY'RE USEFUL BECAUSE THEY'RE A GOOD COMPROMISE
20 BETWEEN RELATIVELY SHORT WAVELENGTHS OF A FEW INCHES.
21 AND THAT MEANS THAT WE CAN HAVE A REASONABLE -- PRETTY
22 GOOD -- MEANING, ON THE ORDER OF A FOOT RESOLUTION, FOR
23 TELLING TARGETS APART.

24 IF WE HAVE TWO AIRCRAFT AND WE WANT TO BE ABLE
25 TO TELL THEM APART, WE WANT TO BE ABLE TO -- THE OTHER

1 ADVANTAGE IS, AS WE GO TO SHORTER WAVELENGTHS, WE CAN
2 MAKE ANTENNAS SMALLER WITH THE SAME TYPE OF PERFORMANCE
3 OF A LARGER ANTENNA. WITH A SMALLER ANTENNA, WE CAN
4 PUT THEM ON AIRCRAFT AND PUT THEM IN SMALLER SPACES
5 THAN WE WOULD WITH THE LOWER FREQUENCIES.

6 Q DO CELLULAR PHONES USE MICROWAVES?

7 A CELLULAR PHONES ARE CONCENTRATED IN THE LOW PART OF
8 THE RANGE.

9 SO AS I MENTIONED, X AND KU-BANDS ARE 8 TO 18
10 GIGAHERTZ. CELLULAR PHONES ARE GENERALLY DOWN IN THE 1
11 TO 6 GIGAHERTZ RANGE, SO THROUGH THAT SECTION THERE.

12 Q NOW, WITH RESPECT TO THE MMIC POWER AMPLIFIERS THAT
13 YOU LOOKED AT IN THIS CASE, WOULD THOSE MMIC POWER
14 AMPLIFIERS BE THE TYPE OF CIRCUIT THAT WE WOULD USE IN
15 A CELLULAR TELEPHONE?

16 A NO.

17 Q WHY NOT?

18 A TWO REASONS. ONE IS, THAT THEY ARE OPERATING AT A
19 FREQUENCY THIS IS NOT IN ANY CELL PHONE BAND.

20 AND SECOND OF ALL, THE POWER IS HIGHER THAN A
21 TYPICAL CELL PHONE POWER.

22 Q COULD THESE MMIC POWER AMPLIFIERS BE POWERED BY A
23 CELL PHONE BATTERY?

24 A NO. THE VOLTAGE IS TOO HIGH.

25 Q HAVE YOU PREPARED A FEW EXAMPLES OF AMPLIFICATION

1 TO HELP EXPLAIN IT TO THE JURY?

2 A YES.

3 Q LET'S TALK ABOUT THE FIRST ONE OF THOSE EXAMPLES,
4 EXHIBIT 5000. IT'S A DEMONSTRATIVE.

5 THE COURT: IS THE -- HAS EACH IMAGE FROM
6 THE -- THAT HAS BEEN SHOWN AS A DEMONSTRATIVE EXHIBIT
7 FROM EXHIBIT 5000?

8 MR. SHOBAKI: YES, YOUR HONOR.

9 THE COURT: LADIES AND GENTLEMEN, AS I HAVE
10 MENTIONED TO YOU, EVIDENCE IN THE CASE INVOLVES
11 TESTIMONY AND EXHIBITS. IT MAY INVOLVE OTHER THINGS.

12 SOMETIMES WE USE WHAT ARE CALLED
13 "DEMONSTRATIVE EXHIBITS," WHICH ARE USED TO ILLUSTRATE
14 OR FACILITATE YOUR UNDERSTANDING OF TESTIMONY. A
15 DEMONSTRATIVE EXHIBIT MAY NOT BE ADMITTED AS AN
16 EXHIBIT. AS I SAY, IT'S HERE TO ILLUSTRATE TESTIMONY.

17 GO AHEAD, PLEASE.

18 MR. SHOBAKI: THANK YOU, YOUR HONOR.

19 BY MR. SHOBAKI:

20 Q SO TURNING TO THE IMAGE DISPLAYED HERE,
21 DEMONSTRATIVE 5000-7.

22 CAN YOU EXPLAIN TO THE JURY THIS EXAMPLE OF
23 AMPLIFICATION?

24 A YES.

25 SO AN AMPLIFIER TAKES A SMALL SIGNAL AND MAKES

1 IT STRONGER. AND THE VERY GOOD EXAMPLE OF AN AMPLIFIER
2 IS THIS MICROPHONE I'M SPEAKING INTO RIGHT NOW. I'M
3 SPEAKING IN A NORMAL VOICE WHERE NORMALLY A PERSON
4 SITTING ACROSS FROM ME CAN HEAR ME, BUT NOBODY ELSE IN
5 THIS ROOM CAN HEAR ME.

6 WHAT THIS MICROPHONE DOES IS, TAKES MY
7 RELATIVELY-QUIET VOICE, TURNS IT INTO AN ELECTRONIC
8 SIGNAL. THAT ELECTRONIC SIGNAL IS AMPLIFIED AND MADE
9 STRONGER AS AN ELECTRONIC SIGNAL AND THEN CONVERTED
10 BACK TO SOUND SO EVERYBODY IN THE ROOM CAN HEAR IT
11 WITHOUT ME HAVING TO YELL.

12 AND SO WHILE THAT'S A CASE WHERE WE'RE
13 TAKING SOUND, CONVERTING IT TO AN ELECTRONIC SIGNAL AND
14 CONVERTING IT BACK TO SOUND MUCH LOUDER, THE AMPLIFIER
15 SERVES A SIMILAR FUNCTION IN THE MICROWAVE CASE WHERE
16 IT TAKES A VERY WEAK MICROWAVE SIGNAL AND MAKES IT MUCH
17 STRONGER FOR OTHER PURPOSES.

18 Q SO TAKING A LOOK AT EXHIBIT 5000-8, CAN YOU EXPLAIN
19 THIS EXAMPLE FOR THE JURY?

20 A YES.

21 SO THIS EXAMPLE IS JUST A SKETCH CARTOON
22 DRAWING THAT SAYS -- FOR EXAMPLE, WE HAVE ON ONE SIDE
23 OF THE WORLD SOME EVENT WE'RE TRYING TO FILM. IN THIS
24 CASE, THE OLYMPICS. AND WE WERE FILMING THAT WITH A
25 TELEVISION CAMERA. THE TELEVISION CAMERA TAKES THOSE

1 IMAGES AND CONVERTS THEM INTO A MICROWAVE SIGNAL. THAT
2 SIGNAL IS RELATIVELY SMALL. AND IT GOES THROUGH THE
3 AMPLIFIER AND MAKES IT LARGER. SO YOU CAN SEE HOW MUCH
4 LARGER THAT SIGNAL IS IN THIS SKETCH.

5 IN THIS EXAMPLE, WE'RE BEAMING THIS AROUND THE
6 WORLD. AND AS THE MICROWAVE TRAVELS THROUGH SPACE --
7 OR THROUGH AIR, THEY DECREASE IN POWER, JUST LIKE SOUND
8 DECREASES AS YOU GET FURTHER AWAY. SO WE NEED A FAIRLY
9 LARGE AMOUNT OF POWER ON THIS ANTENNA SO THAT THE
10 SIGNAL CAN STILL BE DETECTABLE WHEN IT HITS ITS
11 DESTINATION.

12 ANOTHER AMPLIFIER IS THEN USED TO MAKE THAT
13 SIGNAL STRONGER AND RETRANSMIT THAT SIGNAL. SO WE ARE
14 REBROADCASTING THE SIGNAL THE SATELLITE --

15 THE COURT: SLOW DOWN, PLEASE.

16 THE WITNESS: SO WE ARE RETRANSMITTING THAT
17 SIGNAL FROM THE SATELLITE BACK DOWN TO A GROUND
18 STATION. AND THIS CAN BE A LARGE GROUND STATION AT A
19 TELEVISION STATION. IT CAN BE YOUR DIRECTV DISH. THAT
20 SIGNAL, AGAIN, IS VERY WEAK WHEN IT GETS TO YOUR -- THE
21 GROUND STATION.

22 AND THEN ANOTHER AMPLIFIER IS USED TO
23 MAKE THE SIGNAL STRONGER SO THAT IT CAN BE CONVERTED
24 BACK TO THE IMAGES THAT YOU WOULD THEN SEE ON YOUR
25 TELEVISION SET.

1 Q DO YOU HAVE AN EXAMPLE OF RADAR ALSO?

2 A YES.

3 THE COURT: DO WE HAVE A COPY OF THE
4 DEMONSTRATIVE EXHIBITS?

5 MR. SHOBAKI: YOUR HONOR, I PROVIDED A COPY
6 YESTERDAY. IT'S ACTUALLY IN A FOLDER. WE'RE ONLY
7 MAKING THE BINDER FOR IT.

8 THE COURT: THANK YOU.

9 BY MR. SHOBAKI:

10 Q SO THE RADAR?

11 A THE EXAMPLE IS SIMILAR TO THE COMMUNICATION EXAMPLE
12 AND USES MUCH OF THE SAME ELECTRONICS AND PROCESSING
13 AND ANTENNAS.

14 THE DIFFERENCE IS, WE HAVE WHATEVER
15 ELECTRONICS WHERE WE GENERATE A SIGNAL. IT GOES OUT
16 RELATIVELY SMALL. IT'S MADE MUCH LARGER IN A POWER
17 AMPLIFIER. IT IS TRANSMITTED BY THE ANTENNA. AND IT
18 DIES DOWN IN STRENGTH AS IT GETS TO WHATEVER OBJECT
19 WE'RE ATTEMPTING TO SENSE.

20 THE DIFFERENCE IS, THE OBJECT WE'RE ATTEMPTING
21 TO SENSE DOES NOT HAVE ANY AMPLIFICATION, DOES NOT
22 HAVE -- IS NOT RECEIVING A SIGNAL. SO IT'S JUST AN
23 ECHO. YOU CAN THINK OF IT AS AN SOUND ECHO, WHEN YOU
24 YELL FROM ONE LOCATION, YOU HEAR AN ECHO. SO YOU CAN
25 ALSO THINK OF IT AS SHINING A FLASHLIGHT IN THE DARK,

1 AND IT'S REFLECTING OFF OF A MIRROR OR SOMETHING LIKE
2 THAT.

3 SO THAT SIGNAL COMES BACK VERY FAINT.

4 AND, AGAIN, IT GOES BACK IN THROUGH ANOTHER AMPLIFIER
5 TO MAKE THAT LARGER SO THAT WE CAN PROCESS IT IN THE
6 SIGNAL PROCESSING ELECTRONICS AND DETERMINE HOW FAR
7 AWAY THE OBJECT IS AND THE SPEED.

8 ONE POINT THAT'S IMPORTANT IS THAT,
9 BECAUSE THERE'S NOT ANY AMPLIFICATION ON THE OBJECT,
10 THE ECHO RETURN IS MUCH -- IS VERY FAINT. AND IT'S
11 MUCH MORE -- IT IS MUCH FAINTER THAN IT WOULD OVER A
12 COMMUNICATIONS LENGTH OF THE SAME DISTANCE.

13 Q SO FOR USE IN RADAR, IT'S IMPORTANT TO HAVE
14 HIGH-POWER AMPLIFIERS?

15 A YES.

16 Q WHY?

17 A BECAUSE THE HIGHER POWER YOU HAVE, THE FARTHER AWAY
18 YOU CAN DETECT OBJECTS OR THE BETTER RESOLUTION YOU CAN
19 HAVE.

20 Q NOW, WERE YOU ASKED TO CONDUCT TESTING ON MMIC
21 POWER AMPLIFIERS IN CONNECTION WITH THIS CASE?

22 A YES.

23 Q AND, SPECIFICALLY, DID YOU CONDUCT TESTING ON
24 VARIOUS MMIC'S FOUND ON A CREE WAFER ID BE1641-12?

25 A YES.

1 MR. SHOBAKI: YOUR HONOR, WITH THE COURT'S
2 PERMISSION, MAY THE WITNESS LOOK AT EXHIBIT 1?

3 THE COURT: YES.

4 ANY OBJECTION? IT'S BEEN ADMITTED.

5 MR. SPERTUS: NO, YOUR HONOR.

6 BY MR. SHOBAKI:

7 Q DO YOU RECOGNIZE EXHIBIT 1?

8 A YES.

9 Q WHAT IS IT?

10 A THIS IS THE CREE WAFER WITH THE GALLIUM MMIC'S ON
11 IT THAT WE REMOVED THE -- WE TOOK CERTAIN CIRCUITS ON
12 HERE TO TEST. IT HAS ON IT, ON THE TAPE THAT THE WAFER
13 STUCK TO, A LABEL THAT SAYS "BE1641-12."

14 ON THE CLAMSHELL BOX, IT ALSO HAS A LABEL WITH
15 THE SAME WAFER ID, "BE1641-12."

16 ALSO, VISUALLY, THE PATTERN OF THE DICING, HOW
17 THE INTEGRATED CIRCUITS ARE CUT OUT, MATCHES THE WAFER
18 THAT WE HAD.

19 Q AND DOES THAT ALSO MATCH THE GDS FILE THAT YOU
20 LOOKED AT?

21 A YES.

22 Q NOW, IN TESTING THE MMIC POWER AMPLIFIERS FROM THIS
23 BATCH, DID YOU USE ANY PARTICULAR PERFORMANCE
24 PARAMETERS AS A REFERENCE?

25 A YES. WE USED THE OUTPUT POWER AND THE BANDWIDTH OF

1 THE AMPLIFIERS AS THE NUMBERS TO COMPARE AGAINST.

2 Q AND DID THE GOVERNMENT ASK YOU TO COMPARE THE
3 PERFORMANCE OF THESE MMIC POWER AMPLIFIERS WITH SOME
4 SPECIFIC BENCHMARKS?

5 A YES. WE WERE PROVIDED COPIES OF THE COMMERCE
6 CONTROL LIST FOR MMIC POWER AMPLIFIERS.

7 Q AND, SPECIFICALLY, WAS THAT WITH RESPECT TO ECCN
8 NUMBERS 3A001B2B AND 3A001B2C?

9 A YES.

10 Q AND FOR THE PURPOSES OF YOUR TESTING AND TESTIMONY
11 TODAY, WERE THOSE THE RATINGS FROM THE CCL BETWEEN
12 DECEMBER 2013 AND JANUARY 2014?

13 A YES.

14 Q NOW, CAN YOU DESCRIBE HOW YOU WENT ABOUT TESTING
15 THE MMIC'S FROM THE CREE WAFER?

16 A YES.

17 I BELIEVE THERE'S ANOTHER DEMONSTRATIVE
18 COMING; RIGHT?

19 Q YES, WE HAVE SOME PICTURES OF THAT.

20 A OKAY.

21 Q CAN YOU DESCRIBE INITIALLY HOW YOU GOT THE CREE
22 WAFER AND SELECTED PARTS?

23 A OKAY. SO THE CREE WAFER WAS BROUGHT TO SANDIA, TO
24 OUR LAB BY THE DEPARTMENT OF JUSTICE. WE SELECTED
25 SPECIFIC SITES TO PICK MMIC AMPLIFIERS FROM. WE PULLED

1 THEM OFF USING A VACUUM PICK-UP WAND OR A PAIR OF
2 TWEEZERS. I DON'T REMEMBER WHICH. AND THEN PUT THEM
3 IN SEPARATE BOXES SO THAT WE COULD KEEP TRACK OF WHERE
4 THEY CAME FROM ON THE WAFER.

5 AFTER WE SELECTED THEM FROM THE WAFER,
6 FROM THE TAPE, WE RETURNED THE TAPE TO THE DEPARTMENT
7 OF JUSTICE, THE WAFER TO DEPARTMENT OF JUSTICE TO THE
8 AGENT WHO BROUGHT IT TO US. AND WE HAD TO TAKE THE
9 INDIVIDUAL MMIC'S AND DO WHAT IS CALLED "FIXTURE THEM."
10 AND WE CANNOT TEST THESE CHIPS INDIVIDUALLY AS
11 INDIVIDUAL ITEMS; BUT, INSTEAD, WE HAVE TO STICK THEM
12 DOWN TO A CARRIER AND ADD POWER SUPPLY LINES AND
13 CONTROL LINES TO THOSE SO THAT WE CAN TEST THEM ON OUR
14 PROBE STATIONS.

15 Q DID YOU TAKE PHOTOGRAPHS OF THE MMIC'S THAT YOU
16 PICKED OFF OF THE CREE WAFER?

17 A YES.

18 Q CAN YOU PLEASE LOOK IN THE EXHIBIT BINDER AT
19 EXHIBIT 1637.

20 DO YOU RECOGNIZE EXHIBIT 1637?

21 A YES.

22 Q HOW DO YOU RECOGNIZE IT?

23 A THESE ARE THE PICTURES THAT WE TOOK OF SELECTED
24 MMIC'S FROM THAT WAFER IN QUESTION.

25 Q SO YOU RECOGNIZE THE PHOTOGRAPHS?

1 A YES.

2 MR. SHOBAKI: YOUR HONOR, MOVE TO ADMIT
3 EXHIBIT 1637.

4 MR. HANUSZ: NO OBJECTION, YOUR HONOR.

5 THE COURT: EXHIBIT 1637 IS ADMITTED AND MAY
6 BE PUBLISHED.

7 **(EXHIBIT 1637 RECEIVED IN EVIDENCE)**

8 BY MR. SHOBAKI:

9 Q NOW, WITH RESPECT TO YOUR TESTING, DID YOU TEST
10 SOME SPECIFIC DESIGNS OFF OF THIS WAFER?

11 A YES.

12 Q AND WERE THOSE THE TOTAL OF THREE DIFFERENT
13 DESIGNS?

14 A YES.

15 WE TESTED PA1-1020-A1, PA2-1020-A1, AND A
16 PA2-1615-A1.

17 Q WHERE DO THE NAMES FOR THOSE --

18 THE COURT: WHAT PAGE OF THE EXHIBIT ARE YOU
19 NOW PUBLISHING?

20 MR. SHOBAKI: YOUR HONOR, THIS IS PAGE 6.

21 THE COURT: THANK YOU.

22 BY MR. SHOBAKI:

23 Q NOW, YOU JUST SAID SOME NAMES FOR THESE DESIGNS.

24 WHERE DO THOSE NAMES COME FROM?

25 A THE NAMES WERE NAMES THAT WERE IN THE DESIGN FILE.

1 AND, IN FACT, ON THIS ONE, YOU CAN SEE THAT IT IS
2 LABELED ON THE TOP HALF OF THE CHIP WITH THE
3 "PA1-1020-A1."

4 Q AND BASED ON YOUR REVIEW OF THE GDS FILES AND THE
5 TESTING RESULTS FOR THESE POWER AMPLIFIERS, DO YOU HAVE
6 AN UNDERSTANDING AS TO WHAT THAT NAME SIGNIFIES?

7 A YES.

8 Q CAN YOU EXPLAIN THAT?

9 A SO "PA1" MEANS THAT THERE'S A ONE-STAGE OF
10 AMPLIFICATION. YOU CAN THINK OF THIS KIND OF AS THE
11 GEARS. JUST AS BY WAY OF INTRODUCTION, THE POWER COMES
12 IN HERE (INDICATING), AND THE POWER GOES OUT HERE
13 (INDICATING), AND TRAVELS THROUGH THESE VARIOUS PADS
14 INTO THE TRANSISTORS. AND IT'S SPLIT HERE
15 (INDICATING). IT IS THEN AMPLIFIED.

16 SO HERE'S THE TRANSISTOR ITSELF (INDICATING)
17 THAT DOES THE AMPLIFICATION.

18 AND THEN ON THE OUTPUT, IT IS RECOMBINED BACK
19 INTO A SINGLE SIGNAL -- INTO ONE SIGNAL.

20 AND THE PA1 TELLS US IT'S ONE STAGE. THIS
21 MEANS YOU GO THROUGH A BANK OF TRANSISTORS ONCE AND
22 HAVE ONE STAGE OF GAIN.

23 THE "10" PART IS AN INDICATION OF THE
24 APPROXIMATE CENTER OF FREQUENCY OF THE AMPLIFIER.

25 THE "20," THE SECOND HALF OF THAT NUMBER

1 IS THE APPROXIMATE DESIGN OF OUTPUT POWER OF THE
2 AMPLIFIER.

3 AND "A1" IS THE SPECIFIC VARIANT OF THAT
4 DESIGN, THE VERSION OF THE DESIGN.

5 Q IS THAT -- YOU SAID THAT "20" WAS THE INDICATOR OF
6 THE EXPECTED POWER OUTPUT?

7 A YES.

8 Q IS THAT CONSISTENT WITH THE NUMBER OF TRANSISTOR
9 GATES OR THE SIZE OF THE TRANSISTOR GATES?

10 A YES.

11 Q CAN YOU TAKE A LOOK AT THE PICTURE THAT'S ON PAGE 9
12 OF EXHIBIT 1637?

13 A OKAY.

14 Q DO YOU RECOGNIZE THAT MMIC POWER AMPLIFIER?

15 A YES. THAT MMIC POWER AMPLIFIER IS PA2-1020-A1
16 BASED ON THE -- WELL, IT'S LABELED UP HERE
17 (INDICATING).

18 AND THIS IS A TWO-STAGE POWER AMPLIFIER WHERE,
19 AGAIN, WE HAVE THE INPUT AND THE OUTPUT. AND AS THE
20 SIGNAL TRAVELS, WE RUN THROUGH ONE STAGE OF GAIN HERE
21 (INDICATING), ONE SIDE OF TRANSISTORS HERE
22 (INDICATING), AND THEN THROUGH ANOTHER SET OF
23 TRANSISTORS HERE (INDICATING) BEFORE THE SIGNAL IS,
24 AGAIN, RECOMBINED AT THE OUTPUT. SO THIS IS A
25 TWO-STAGE, WHICH MEANS IT'S GOING TO HAVE MORE GAIN.

1 THE 1020 IS CONSISTENT BEFORE AS A 10
2 GIGAHERTZ AMPLIFIER WITH 20 WATTS OF POWER.

3 AND "A1" IS THE VERSION.

4 Q AND THOSE NUMBERS THAT APPEAR ON THESE MMIC'S, WERE
5 THOSE IN THE DESIGN FILE?

6 A YES.

7 Q AND WERE THOSE NUMBERS THEN ETCHED SOMEHOW ONTO
8 THIS?

9 A YES. THEY WERE PRINTED AS PART OF THE DESIGN FILE
10 AND ONTO THE CHIP.

11 Q FINALLY, WITH RESPECT TO THE PICTURES, I'D LIKE YOU
12 TO TAKE A LOOK AT PAGE 11 OF EXHIBIT 1637.

13 A OKAY.

14 Q AND DO YOU RECOGNIZE THAT MMIC POWER AMPLIFIER?

15 A YES. THIS IS DESIGN PA2-1615-A1. AGAIN, IT'S
16 LABELED UP HERE (INDICATING).

17 THE "2" MEANS, AGAIN, IT HAS TWO STAGES. SO
18 ONE STAGE HERE (INDICATING). ANOTHER STAGE HERE
19 (INDICATING).

20 THE "16" IS THE NOMINAL CENTER FREQUENCY OF
21 THE DESIGN.

22 AND "15" IS A 15-WATT DESIGN.

23 Q NOW, YOU PREVIOUSLY MENTIONED DOING SOME THINGS TO
24 TEST THE MMIC'S.

25 TAKING A LOOK AT DEMONSTRATIVE EXHIBIT

1 5000-13, CAN YOU EXPLAIN WHAT THAT IS?

2 A EXHIBIT 5000-13 IS A PICTURE OF A FIXTURED PART ON
3 THE LEFT. WHAT YOU SEE IN THE CENTER IS THE ACTUAL
4 MMIC ITSELF RIGHT HERE (INDICATING) IN THIS SMALL
5 SQUARE.

6 ON THE RIGHT IS A CLOSE-UP OF THAT MMIC. SO
7 IT'S HERE (INDICATING).

8 THE SMALL WIRES THAT ATTACH THE MMIC TO THE
9 REST OF THE TEST FIXTURE ARE BONDED FROM THE MMIC TO
10 THE OTHER COMPONENTS HERE (INDICATING) AND HERE
11 (INDICATING).

12 THAT GOES OUT GOING -- REFERRING BACK TO THE
13 LEFT SIDE AGAIN WHERE WE HAVE A PICTURE OF A HEAT SINK.
14 THAT'S THIS LARGE BLOCK WITH THE FOUR HOLES ON THE
15 OUTSIDE HERE (INDICATING).

16 AND THEN WE HAVE FOUR DIFFERENT PINS ON EACH
17 OF THESE -- ON EACH SIDE, WHICH ARE USED TO SUPPLY THE
18 POWER SUPPLY TO THE MMIC'S. YOU CAN THINK OF THAT AS A
19 HIGH-VOLTAGE BATTERY, AS WELL AS A CONTROL TO CONTROL
20 THE GATE.

21 AND, FINALLY, ONE PIN FOR GROUND FOR THE
22 CONTROL SIGNALS.

23 Q AND LOOKING AT DEMONSTRATIVE EXHIBIT 5000-14, CAN
24 YOU EXPLAIN WHAT THAT SHOWS?

25 A SO THIS IS THAT SAME ASSEMBLY THAT WE PUT TOGETHER

1 ON THE PROBE STATION.

2 SO HERE'S THE MMIC IN THE CENTER HERE WHERE I
3 PUT THE BLUE DOT.

4 THE WIRES THAT ATTACH TO THE POWER SUPPLY ARE
5 COMING IN FROM THE FRONT AND THE BACK OF THE PROBE
6 STATION, SO HERE (INDICATING) AND HERE (INDICATING).

7 AND THIS IS THE GROUND FOR THAT (INDICATING).

8 THE MICROWAVE SIGNAL COMES IN THROUGH THIS
9 CABLE HERE (INDICATING), DOWN THROUGH THIS PROBE AND IS
10 INTRODUCED TO THE MMIC RIGHT THERE TO THE BLUE LINE I
11 JUST DREW. IT'S AMPLIFIED ON THE CHIP. IT COMES BACK
12 OFF OF THE CHIP ON THIS PROBE AND THEN GOES BACK OUT
13 THROUGH THAT CABLE TO THE POWER METER WHERE THE OTHER
14 TEST EQUIPMENT IS.

15 Q DID YOU USE EQUIPMENT IN YOUR LAB TO TEST THE
16 PERFORMANCE OF THESE MMIC'S?

17 A YES.

18 Q AND BEFORE DOING THAT TESTING, DID YOU CALIBRATE
19 ALL THE LAB EQUIPMENT?

20 A ALL OF THE LAB EQUIPMENT HAD BEEN CALIBRATED WITHIN
21 THE LAST FEW MONTHS.

22 Q WHY IS THAT IMPORTANT?

23 A BECAUSE WE WANT TO MAKE SURE THAT THE DATA IS
24 CORRECT.

25 Q NOW, BASED ON YOUR TESTING, DID YOU DETERMINE THE

1 PERFORMANCE OF THE THREE MMIC DESIGN -- POWER AMPLIFIER
2 DESIGNS WE'VE BEEN TALKING ABOUT?

3 A YES.

4 Q SO LET'S TALK ABOUT THOSE RESULTS.

5 FIRST, WITH RESPECT TO POWER AMPLIFIER
6 1-1020-A1, LOOKING AT DEMONSTRATIVE EXHIBIT 5000-16,
7 CAN YOU EXPLAIN THE RESULTS OF YOUR TESTING?

8 A YES. SO THE -- WELL, THIS FIRST IS, PA2-1020-A1 IS
9 THE PART NUMBER THAT WAS TESTED. IT CAME FROM SITE ROW
10 4, COLUMN 7. ON THIS PLOT, THE "XX" IS FREQUENCY
11 RANGING FROM 8 GIGAHERTZ TO 12 GIGAHERTZ.

12 ON THE LEFT SIDE OF THE AXIS IS THE SATURATED
13 POWER OF THE AMPLIFIER. SO THIS IS THE MAXIMUM POWER
14 OF THE AMPLIFIER. ON THE RIGHT SIDE IS THE POWER. THE
15 POWER UNIT IS SUPPLIED DIFFERENTLY IN WATTS.

16 AND WHAT WE SEE, AS WE LOOK AT THE POINTS ON
17 THIS PLOT, WE SEE THAT FROM 8 THROUGH 12-AND-A-HALF
18 GIGAHERTZ, WHERE WE MEASURED THE POWER, THE POWER WAS
19 AT LEAST 40 DBM. AND IN SOME CASES, IT IS AS HIGH AS
20 42 DBM. SO 40 DBM IS 10 WATTS. AND 42 DBM IS,
21 APPROXIMATELY, 16 WATTS.

22 THE OTHER ITEM TO NOTE IS THAT, THE 3 DBM
23 BANDWIDTH -- SO 3 DBM BANDWIDTH IS WHAT IS USED TO
24 MEASURE BANDWIDTH. AND THE WAY THAT'S MEASURED IS YOU
25 WOULD TAKE A -- YOUR MAXIMUM OUTPUT POWER, WHICH IN

1 THIS CASE IS 42. YOU GO DOWN BY 3 DB TO WHAT WOULD BE
2 39. AND THEN YOU MEASURE HOW FAR IT IS BEFORE THE
3 RESPONSE CROSSES BELOW THAT LINE.

4 SO IN THIS CASE, THE 3 DB BANDWIDTH IS BROADER
5 THAN WHAT WE MEASURED. SO IT'S GREATER THAN THE 4.7
6 GIGAHERTZ AND GREATER THAN 46 PERCENT.

7 Q SO ON THIS GRAPH, THOSE LITTLE BLUE DOTS, ARE THOSE
8 THE READINGS THAT YOU TOOK?

9 A YES.

10 Q IS THIS A BROADBAND AMPLIFIER?

11 A YES.

12 Q AND WHAT DOES THAT MEAN?

13 A IT MEANS IT CAN COVER MULTIPLE FREQUENCIES OR A
14 RANGE OF FREQUENCIES AT THE SAME TIME.

15 Q OKAY. MOVING ON TO -- ACTUALLY, WITH RESPECT TO
16 THIS MMIC DESIGN, PA1-1020-A1, DOES THIS PERFORMANCE
17 EXCEED THE PARAMETERS THAT YOU WERE ASKED TO EVALUATE
18 IT WITH RESPECT TO THE CCL?

19 A SO THE CCL IN THIS FREQUENCY RANGE SPECIFIES A
20 BANDWIDTH OF 10 PERCENT OR GREATER AND A POWER OUTPUT
21 OF 1 WATT. AND SO BOTH THE BANDWIDTH AND THE POWER
22 OUTPUT EXCEEDED THOSE NUMBERS.

23 Q OKAY. MOVING ON TO POWER AMPLIFIER 2-1020-A1.

24 DID YOU ALSO TEST THAT ONE?

25 A WE HAVE BEEN LOOKING AT THE PLOT FOR PA2. WE MAY

1 HAVE SKIPPED PA1.

2 Q I'M SORRY, SO WE WERE TALKING ABOUT PA2 THERE.

3 WITH RESPECT TO PA1-1020-A1, DID YOU ALSO TEST
4 THAT ONE?

5 A YES.

6 Q AND CAN YOU DISCUSS THE RESULTS OF YOUR TESTS WITH
7 REFERENCE TO DEMONSTRATIVE EXHIBIT 5000-17?

8 A WE ARE ON 5000-15.

9 Q OH, I'M SORRY. MY NUMBERING IS JUST OFF.

10 SO 5000-15.

11 A OKAY. SO, AGAIN, IF WE LOOK AT THE ACTUAL MEASURE
12 DATA POINTS, IN THIS CASE FROM 8-AND-HALF TO JUST ABOVE
13 13 GIGAHERTZ, ALL OF THE DATA POINTS ARE ABOVE A POWER
14 OF 10 WATTS. AND THEY'RE APPROACHING 20 WATTS IN SOME
15 CASES. THEY DON'T MAKE IT TO 20 WATTS; BUT THAT'S THE
16 POWER RANGE OF APPROXIMATELY 16 WATTS, IF I RECALL
17 CORRECTLY.

18 THE BANDWIDTH IS GREATER THAN THE MEASUREMENT
19 RANGE, AND SO IT'S GREATER THAN THE 4.6 GIGAHERTZ SHOWN
20 HERE.

21 Q SO, AGAIN, WITH RESPECT TO THIS POWER AMPLIFIER
22 DESIGN, WHICH IS POWER AMPLIFIER 1 1020-A1, DID YOU
23 REACH A CONCLUSION AS TO WHETHER IT EXCEEDED THE
24 PARAMETERS SET FORTH IN THIS CCL?

25 A YES, IT DOES.

1 Q TALKING ABOUT THE FINAL DESIGN THAT YOU TESTED,
2 POWER AMPLIFIER 1615, CAN YOU PLEASE DISCUSS THE
3 RESULTS OF YOUR TESTING WITH RESPECT TO THAT POWER
4 AMPLIFIER?

5 A YES. SO THIS POWER AMPLIFIER IS AT A HIGHER
6 FREQUENCY. SO NOW YOU SEE THAT THE RANGE ON THE
7 FREQUENCY GOES FROM 14-AND-A-HALF GIGAHERTZ TO 18
8 GIGAHERTZ. AND THE POWER RANGES FROM -- AGAIN, LOOKING
9 AT THE PLOT, THE MAXIMUM IS RIGHT NEAR 9 WATTS. THE
10 MINIMUM WITHIN THE BAND WE MEASURED IS A LITTLE MORE
11 THAN 6 WATTS ACROSS THE ENTIRE BANDWIDTH. SO IT'S
12 GREATER THAN 23 PERCENT.

13 Q AND WITH RESPECT TO POWER AMPLIFIER 2 1615-A1, DOES
14 THAT CROSS BETWEEN TWO DIFFERENT PARTS OF THE CCL YOU
15 WERE ASKED TO LOOK AT?

16 A YES. THE POWER SPECIFICATION IN THE CCL FOR
17 FREQUENCY LESS THAN 16 GIGAHERTZ IS 1 WATT. AND THE
18 POWER FREQUENCY -- THE POWER SPECIFICATION FOR
19 FREQUENCY GREATER THAN 16 GIGAHERTZ IS 0.8 WATTS.

20 Q AND, AGAIN, DID THIS POWER AMPLIFIER EXCEED THE CCL
21 PARAMETERS ACROSS THAT WHOLE SPECTRUM?

22 A YES.

23 Q NOW, DID THESE THREE POWER AMPLIFIER DESIGNS
24 PERFORM CONSISTENTLY WITH THE DESIGNS?

25 A YES.

1 Q SO BASED ON THE DESIGN -- THE DESIGNS THAT YOU
2 LOOKED AT, WAS THE EXPECTATION TO HAVE THIS SORT OF
3 PERFORMANCE?

4 A YES.

5 Q DID YOU ALSO REVIEW SOME TEST RESULTS FOR MMIC
6 POWER AMPLIFIERS FROM THAT SAME WAFER, EXHIBIT 1, THAT
7 WERE DONE BY CREE?

8 A YES.

9 Q AND WERE THOSE RESULTS RELEVANT TO YOUR OPINIONS?

10 A YES.

11 THE CREE TESTED THE PA2 1615-A1. AND THEY
12 OBTAINED RESULTS THAT WERE, AGAIN, CONSISTENT WITH THE
13 DESIGN AND CONSISTENT WITH OUR MEASUREMENTS.

14 Q AND BASED ON YOUR EXPERIENCE WITH MMIC POWER
15 AMPLIFIERS AND CHIP DESIGN, IS THAT WHAT YOU WOULD
16 EXPECT?

17 A I WOULD EXPECT THAT EVERYTHING ELSE AROUND THE MMIC
18 BEING EQUAL, WE SHOULD SEE THE SAME PERFORMANCE.

19 Q WHY IS THAT?

20 A BECAUSE THE FOUNDRY TRIES VERY HARD TO MAKE SURE
21 THAT EVERY CHIP THEY PRODUCE IS AS SIMILAR AS POSSIBLE.
22 AND THAT WAY WE CAN DESIGN AN ELECTRONIC SYSTEM OR A --
23 WHATEVER WE NEED A PART FOR, AND WE CAN ASSUME THAT ANY
24 PART COMING FROM A FOUNDRY WITH THIS DESIGN THAT WORKS
25 IS GOING TO HAVE SIMILAR ENOUGH PERFORMANCE, THAT IT

1 WILL WORK IN THAT SYSTEM.

2 Q PREVIOUSLY YOU MENTIONED THE "PCM" PORTIONS OF THE
3 WAFER?

4 A YES.

5 Q WHAT ARE THOSE AGAIN?

6 A THOSE ARE INCLUDED ON EACH WAFER THAT THE FOUNDRY
7 MAKES OVER MANY DIFFERENT CUSTOMERS AND LONG PERIODS OF
8 TIME. AND THEY'RE USED TO MONITOR THE PERFORMANCE AND
9 THE PROPERTIES OF THE -- WHAT THEY'RE BUILDING.

10 Q NOW, DID YOU REVIEW SOME PCM DATA FOR THE WAFERS
11 THAT WERE PRODUCED AT THE SAME TIME AS EXHIBIT 1, THE
12 CREE WAFER?

13 A YES.

14 Q AND DID THAT INCLUDE PCM DATA FOR THIS CREE WAFER,
15 EXHIBIT 1?

16 A YES.

17 Q AND HOW MANY WAFERS WERE PRODUCED IN THAT RUN BASED
18 ON THE PCM DATA?

19 A THERE WERE FOUR WAFERS IN THAT LOT.

20 Q AND BASED ON THAT PCM DATA, WOULD YOU EXPECT THAT
21 THE MMIC POWER AMPLIFIERS WITH THE SAME DESIGN ON EACH
22 OF THE WAFERS WOULD HAVE THE SAME PERFORMANCE?

23 A YES.

24 Q WHY IS THAT?

25 A ALL OF THE PCM DATA WAS WITHIN PLUS OR MINUS 3

1 PERCENT FOR ALL OF THE RELEVANT PARAMETERS THAT WOULD
2 PREDICT FREQUENCY RESPONSE AND GAIN. AND THAT MEANS
3 THAT THE AMPLIFIERS SHOULD BE WITHIN THAT SAME RANGE OF
4 TOLERANCE ACROSS THE WAFERS AND ACROSS FROM WAFER TO
5 WAFER.

6 Q SO, FOR EXAMPLE, WOULD A COPY OF PA2-1615-A1 FROM
7 ONE OF THE OTHER THREE WAFERS IN THAT DESIGN SET HAVE
8 SUBSTANTIALLY THE SAME PERFORMANCE AS ONE TAKEN OFF OF
9 EXHIBIT 1?

10 A YES.

11 Q AND WOULD THAT BE THE SAME FOR THE OTHER TWO
12 DESIGNS?

13 A YES.

14 Q AND, INDEED, FOR ANY DESIGN ON THE WAFER?

15 A YES.

16 Q HAVE YOU PHYSICALLY SEEN ANY OF THE OTHER WAFERS
17 FROM THE CREE PRODUCTION RUN THAT INCLUDED EXHIBIT 1?

18 A NO.

19 Q CAN YOU TAKE A LOOK AT EXHIBIT 2809, PLEASE.

20 A OKAY.

21 Q HAVE YOU HAD AN OPPORTUNITY TO LOOK AT THAT?

22 A YES.

23 Q AND WHAT IS THAT EXHIBIT?

24 A SO THIS IS A PICTURE OF ANOTHER WAFER. THE WAFER
25 HAS -- IS IN A -- SIMILAR TO EXHIBIT 1, IT'S IN THE

1 SAME TYPE OF CLAMSHELL PLASTIC PACKAGING.

2 THAT PLASTIC PACKING HAS A LOT NUMBER THAT
3 MATCHES THE LOT NUMBER ON EXHIBIT 1.

4 AND IT HAS A WAFER ID THAT IS DIFFERENT
5 BECAUSE IT'S A DIFFERENT WAFER, BUT IS ALSO PART OF
6 THAT LOT.

7 AND THE WAFER NUMBER APPEARS IN THE PCM DATA
8 SHEET PROVIDED BY CREE.

9 IT ALSO HAS, ON THE BOTTOM OF THE -- ON THE
10 BOTTOM OF THE STICKY TAPE, THE SAME PLACE AS THE
11 STICKER HERE (INDICATING), IT HAS ANOTHER STICKER WITH
12 THE BAR CODES ON IT THAT HAS THE WAFER NUMBER,
13 LS0125-03. SO THAT IT'S ON THE SAME WAFER.

14 ALSO, LOOKING AT IT, YOU CAN SEE THAT THE
15 Dicing PATTERN, THE CUT PATTERN AND THE LOCATION OF THE
16 PCM ARE THE SAME AS THIS WAFER.

17 Q AND BASED ON LOOKING AT THAT PHOTOGRAPH, DO YOU
18 HAVE AN OPINION AS TO WHAT THAT IS A PICTURE OF?

19 A THIS IS A PICTURE OF WAFER LS0125-03, WHICH IS ONE
20 OF THE OTHER WAFERS FROM THE CREE RUN FROM WHICH THIS
21 WAFER CAME FROM.

22 Q NOW, CAN YOU PLEASE LOOK AT EXHIBIT 2803.

23 MR. HANUSZ: YOUR HONOR, IF I MAY BEFORE WE
24 CONTINUE?

25 WE HAD SOME PRETRIAL ADMISSIBILITY ISSUES

1 WITH RESPECT TO SOME OF THESE EXHIBITS BEFORE THEY'RE
2 PUBLISHED.

3 THE COURT: ADDRESS THOSE WHEN THE ADMISSION
4 IS MOVED. AT THIS POINT, THEY'RE JUST BEING VIEWED BY
5 THE WITNESS.

6 2803?

7 MR. SHOBAKI: YES, YOUR HONOR.

8 THE WITNESS: I HAVE 2803 AND 2803-A.

9 BY MR. SHOBAKI:

10 Q YES.

11 CAN YOU LOOK AT 2803-A, SECOND PAGE, PLEASE.

12 A OKAY.

13 Q WHAT DO YOU SEE ON THAT PAGE?

14 A THIS IS ANOTHER WAFER PHOTO. IT IS A WAFER IN A
15 SIMILAR CLAMSHELL AS THIS ONE. IT HAS ON IT A STICKER
16 ON THE BOTTOM, WHICH IS A WAFER NUMBER - THAT DOESN'T
17 SHOW UP VERY WELL ON THIS RENDERING - THAT MATCHES THE
18 WAFER -- ONE OF THE OTHER WAFER NUMBERS IN THE CREE
19 LOT.

20 AND THAT PIECE OF TAPE IS STUCK TO THE SAME
21 BLUE STICKY TAPE AS THE WAFER ITSELF, AS THE CHIPS ARE.

22 Q YOU PREVIOUSLY MENTIONED THAT THE WAFERS ARE PUT ON
23 A PIECE OF STICKY TAPE AND THEN THEY'RE DICED; RIGHT?

24 A YES.

25 Q NOW, IS THE -- THE STICKERS YOU HAVE BEEN TALKING

1 ABOUT, WHAT ARE THOSE ATTACHED TO?

2 A THOSE ARE ATTACHED TO THE SAME STICKY TAPE AS THE
3 WAFER.

4 Q SO THE STICKY TAPE GOES ALONG WITH THE WAFER UNTIL
5 MMIC'S ARE TAKEN OFF OF THEM?

6 A YES.

7 Q BASED ON LOOKING AT THAT PICTURE, DO YOU HAVE AN
8 OPINION AS TO WHAT THAT IS A PICTURE OF?

9 A THIS IS A PICTURE OF ONE OF THE OTHER WAFERS FROM
10 THE SAME CREE LOT AS EXHIBIT 1.

11 Q NOW, IN ADDITION TO THE CREE TEST RESULTS THAT YOU
12 JUST TALKED ABOUT, DID YOU REVIEW ANY --

13 MR. HANUSZ: YOUR HONOR, CAN WE HAVE A
14 SIDEBAR?

15 THE COURT: YES. JUST A MOMENT.

16 **(SIDEBAR)**

17 MR. HANUSZ: YOUR HONOR, WE HAVE FOUNDATIONAL
18 OBJECTIONS TO THESE EXHIBITS.

19 I ACTUALLY HAD A DISCUSSION WITH
20 MR. SHOBAKI ABOUT THE EXHIBITS HE INTENDS TO USE. IN
21 THIS DEMONSTRATION WITH THIS WITNESS, HE SAID THE ONLY
22 EVIDENCE -- THE ONLY ITEMS HE WOULD USE IS THE
23 DEMONSTRATIVE EXHIBIT.

24 WE HAVE FOUNDATIONAL OBJECTIONS TO THESE
25 EXHIBITS. WE WERE NOT TOLD THAT THEY WOULD BE USED.

1 AND HE'S RENDERING OPINIONS ABOUT THINGS THAT ARE NOT
2 IN EVIDENCE.

3 MR. ROLLINS: YES, YOUR HONOR. EXPERTS CAN
4 REVIEW -- REGARDLESS OF WHETHER THOSE DOCUMENTS COME
5 INTO EVIDENCE OR NOT, EXPERTS ARE ALLOWED TO REVIEW AND
6 FORM OPINIONS BASED ON MATERIALS THAT ARE NOT
7 NECESSARILY IN EVIDENCE. AND THAT'S WHAT I'VE BEEN
8 ASKING HIM TO DO.

9 THE COURT: BUT -- JUST A MINUTE.

10 THE OPINION THAT HE RENDERED WAS, THAT
11 THE EXHIBIT HE WAS OBSERVING WAS FROM THE SAME LOT AS
12 EXHIBIT 1. THAT WAS HIS OPINION.

13 CORRECT?

14 MR. SHOBAKI: YES, YOUR HONOR.

15 THE COURT: ISN'T THAT JUST DESCRIBING THE
16 EXHIBIT AS OPPOSED TO FORMING AN OPINION BASED ON
17 REVIEWING SOMETHING THAT MAY BE INADMISSIBLE?

18 MR. SHOBAKI: WELL, HE FORMED AN OPINION THAT
19 THERE WERE OTHER WAFERS, AND THERE'S A PICTURE OF IT,
20 AND THAT IT EXISTED.

21 MR. HANUSZ: YOUR HONOR, HE -- HE HAS NO BASIS
22 FOR MAKING THESE CONCLUSIONS THAT HE'S MAKING. THESE
23 ARE CONCLUSIONS THAT THE GOVERNMENT IS MAKING THROUGH
24 THIS WITNESS, BUT THERE'S NO INDEPENDENT BASIS.

25 THE COURT: I DON'T THINK THAT'S AN OPINION.

1 I THINK THAT'S DESCRIBING THE EXHIBIT.

2 AND WHAT IS THE BASIS FOR HIS OPINION,
3 OTHER THAN WHAT HE SEES ON THE EXHIBIT?

4 MR. SHOBAKI: WELL, HIS REVIEW OF THE PCM
5 DATA, WHICH IS ALSO ANOTHER DOCUMENT, AND HIS VALUATION
6 OF WHETHER THERE ARE -- IS THIS PICTURE -- HE NEEDS
7 SOMETHING TO LOOK AT IN ORDER TO BE ABLE TO EVALUATE
8 WHETHER ANOTHER WAFER EXISTS OR NOT.

9 ANOTHER POINT IS THAT, WITH RESPECT TO
10 THESE DOCUMENTS, THE GOVERNMENT BELIEVES THEY WILL COME
11 INTO EVIDENCE. AND SO TO THE EXTENT THAT THE COURT HAS
12 A CONCERN ABOUT THIS DOCUMENT NEVER COMING IN, I
13 BELIEVE THAT WE WILL BRING THESE DOCUMENTS INTO
14 EVIDENCE.

15 THE COURT: THROUGH WHAT WITNESS DO YOU
16 ANTICIPATE THESE -- HOW -- THROUGH WHAT WITNESS DO YOU
17 ANTICIPATE THEY COULD BECOME ADMISSIBLE?

18 MR. SHOBAKI: THESE DOCUMENTS ARE GOING TO BE
19 TESTIFIED TO BY EITHER AGENT STORINO OR AGENT BERGER.
20 THEY COME FROM THE DIGITAL DEVICES WHICH WE TALKED
21 ABOUT YESTERDAY AND AUTHENTICATED YESTERDAY.

22 MR. HANUSZ: YOUR HONOR, THE GOVERNMENT IS
23 PUTTING THE CART BEFORE THE HORSE. IF THEY WANT TO
24 CALL MR. -- DR. NORDQUIST TO TESTIFY AFTER THE
25 FOUNDATION IS LAID, THAT'S FINE.

1 THE COURT: OKAY. I THINK WE NEED TO MOVE ON
2 AT THIS POINT.

3 MR. SHOBAKI: I PLAN TO.

4 THE COURT: MY VIEW IS THIS -- AND I'M -- TO
5 THE EXTENT THAT THE -- THAT WE'RE LOOKING -- I'M
6 LOOKING HERE AT EXHIBIT 2803-A.

7 TO THE EXTENT THAT THE DATA, WHETHER THE
8 BAR CODE OR THE NUMBERS OR SOMETHING ELSE, CORRESPONDS
9 TO THE EVIDENCE -- WOULD SHOW THAT IT CORRESPONDS TO
10 THE LOT THAT IS THE SAME AS EXHIBIT -- AS THE LOT IN
11 EXHIBIT 1, THEN EVIDENCE OF THAT MIGHT BE PRESENTED.

12 BUT I DON'T THINK THIS WITNESS OPINING ON
13 THAT UNTIL THIS WITNESS -- UNTIL THIS EXHIBIT'S
14 ADMISSIBILITY IS ESTABLISHED IS APPROPRIATE.

15 MR. SHOBAKI: OKAY, YOUR HONOR.

16 I HAVE A COUPLE MORE -- I HAVE A COUPLE
17 MORE EXHIBITS THAT I'M GOING TO HAVE HIM TALK ABOUT,
18 WHICH DO NOT DEAL WITH HIM DESCRIBING THE CONTENTS OF
19 THE EXHIBIT; BUT, RATHER, THEY'RE, AGAIN, EXHIBITS HE
20 REVIEWED WHICH FORMED HIS OPINION ABOUT THE PERFORMANCE
21 OF THE CHIPS.

22 MR. HANUSZ: THE PROBLEM, YOUR HONOR, IS THE
23 GOVERNMENT DESCRIBES THESE THINGS IN DEPTH IN THE
24 QUESTIONING OF THE WITNESS. THEY DON'T -- WILL YOU
25 HOLD ON A SECOND?

1 THEY DON'T HAVE TO INTRODUCE IT INTO
2 EVIDENCE BECAUSE THEY PUT IN ALL THE INFORMATION IN
3 THEIR QUESTION AND IN THE ANSWER FROM THE WITNESS.

4 THE COURT: WELL --

5 MR. SHOBAKI: YOUR HONOR, I THINK YOU CAN BE
6 INFORMED BY THE WAY I ASKED THE QUESTION ABOUT THE CREE
7 TEST REPORT. I DID NOT ASK ABOUT ANY SPECIFIC FINDINGS
8 OF THE CREE TEST REPORT. I SIMPLY ASKED IF IT FORMED
9 HIS OPINION. HE SAID IT DID BECAUSE IT WAS CONSISTENT.

10 THE COURT: I HAVE TO TAKE THIS QUESTION BY
11 QUESTION.

12 THIS EXHIBIT, I'VE RULED ON.

13 WITH RESPECT TO THE OTHER OPINION YOU ARE
14 SEEKING, WHAT IS YOUR PROPOSED QUESTION?

15 MR. SHOBAKI: I'M GOING TO ASK HIM TO LOOK AT
16 A DOCUMENT AND ASK IF IT HAS INFORMED HIS OPINION.
17 IT'S A DOCUMENT SHOWING ADDITIONAL TEST RESULTS FOR THE
18 CREE WAFER MMIC'S, WHICH THE GOVERNMENT CONTENDS ARE
19 TEST RESULTS THAT WERE DONE IN CHINA, WHICH WILL BE
20 DISCUSSED BY SOMEONE ELSE.

21 THE QUESTION IS, WHETHER IT INFORMED HIS
22 OPINION AND --

23 THE COURT: HIS OPINION?

24 MR. SHOBAKI: ABOUT THE PERFORMANCE
25 CHARACTERISTICS OF THE MMIC'S BECAUSE IT SHOWS TEST

1 RESULTS THAT ARE CONSISTENT WITH HIS TEST RESULTS.

2 MR. HANUSZ: SO I THINK HE CAN ASK THE
3 QUESTION. BUT PUTTING THE DOCUMENTS IN FRONT OF THE
4 WITNESS AND IN FRONT OF THE JURY, I THINK IS
5 INAPPROPRIATE.

6 THE COURT: WE'RE NOT GOING TO PUBLISH THEM.
7 BUT THE WITNESS CAN REVIEW THE DOCUMENT AS PART OF
8 FORMING AN OPINION, EVEN IF THE DOCUMENT IS NOT
9 ADMISSIBLE. BUT THAT'S DISTINCT FROM DESCRIBING A
10 DOCUMENT, WHICH IS THE FUNCTIONAL EQUIVALENCE OF
11 ADMITTING IT.

12 MR. SHOBAKI: I AGREE WITH THE COURT'S
13 DISTINCTION. AND I WILL NOT BE SEEKING TO DISCUSS THE
14 CONTENTS OF THE DOCUMENT.

15 MR. HANUSZ: WE WOULD MOVE TO STRIKE HIS
16 TESTIMONY, YOUR HONOR.

17 THE COURT: OKAY. JUST A MINUTE.

18 MR. HANUSZ: THIS PARTICULAR TESTIMONY.

19 THE COURT: THE TESTIMONY CONCERNING WHETHER
20 EXHIBIT 2803 WAS A WAFER SIMILAR TO THAT WHICH IS IN
21 LOT 1 IN EXHIBIT 1?

22 MR. HANUSZ: YES.

23 THE COURT: I CAN DO THAT FOR THE REASONS
24 STATED, BUT IF THE -- RECOGNIZE THAT IF THE -- IF THE
25 EXHIBIT IS LATER ADMITTED, THEN I'M GOING TO BE ASKED

1 TO REINSTATE THE TESTIMONY.

2 MR. SHOBAKI: THE GOVERNMENT WOULD MAKE THAT
3 REQUEST, YOUR HONOR. DR. NORDQUIST, HIS SCHEDULE
4 DOESN'T ALLOW HIM TO BE HERE FOR THE NEXT FEW WEEKS.
5 SO WE'LL RAISE THAT WITH THE COURT AT THE APPROPRIATE
6 TIME.

7 THE COURT: THAT'S FINE.

8 MR. SHOBAKI: THANK YOU, YOUR HONOR.

9 **(THE FOLLOWING PROCEEDINGS WERE HELD IN
10 OPEN COURT IN THE PRESENCE OF THE JURY:)**

11 THE COURT: LADIES AND GENTLEMEN, YOU MAY
12 RECALL THAT IN THE INSTRUCTIONS THAT I HAVE PREVIOUSLY
13 GIVEN YOU, ONE OF THE THINGS I SAID WAS, THERE MAY BE
14 TIMES WHERE I DIRECT YOU TO DISREGARD EVIDENCE OR
15 TESTIMONY THAT HAS BEEN PRESENTED.

16 WHAT I'M GOING TO TELL YOU NOW -- THERE'S
17 BEEN, JUST MOST RECENTLY, SOME TESTIMONY ABOUT EXHIBIT
18 2803-A, AND WHETHER -- CONCERNING WHETHER IT WAS
19 SIMILAR TO THE CREE WAFER THAT'S EXHIBIT -- IDENTIFIED
20 AS EXHIBIT 1.

21 I'M GOING TO STRIKE THAT TESTIMONY.

22 AND TO THE EXTENT -- IF THIS ISSUE COMES
23 UP LATER, I MAY GIVE YOU FURTHER INSTRUCTIONS ABOUT IT.

24 THANK YOU.

25 PLEASE PROCEED, MR. SHOBAKI.

1 BY MR. SHOBAKI:

2 Q DR. NORDQUIST, CAN YOU TAKE A LOOK AT EXHIBIT 2804.

3 A OKAY.

4 Q AND IN THE COURSE OF FORMING YOUR OPINIONS ABOUT
5 THE PERFORMANCE OF THE MMIC POWER AMPLIFIER DESIGNS
6 WE'VE BEEN TALKING ABOUT, DID YOU REVIEW THAT DOCUMENT?

7 A YES.

8 Q AND WAS IT RELEVANT TO YOU FORMING YOUR OPINIONS AS
9 TO THE PERFORMANCE OF THE MMIC AMPLIFIERS?

10 A YES.

11 Q DID THE -- DID THE EXHIBIT CONTAIN RESULTS FOR
12 POWER AMPLIFIER 1020-A1 THAT WERE CONSISTENT WITH YOUR
13 RESULTS?

14 A YES. THE EXHIBIT CONTAINS, SPECIFICALLY, RESULTS
15 FROM PA2-1020-A1. IT CONTAINS A SCREEN SHOT OF A
16 LAYOUT. IT ALSO CONTAINS A PHOTOGRAPH OF THIS
17 INTEGRATED CIRCUIT.

18 MR. HANUSZ: YOUR HONOR, OBJECTION.

19 NONRESPONSIVE.

20 THE COURT: JUST A MOMENT.

21 WOULD YOU PLEASE RESTATE THE QUESTION
22 THAT INVITES AN OPINION AND NOT DESCRIBING THE EXHIBIT?

23 BY MR. SHOBAKI:

24 Q IS IT YOUR OPINION THAT THE TEST RESULTS SHOWN IN
25 THAT DOCUMENT ARE CONSISTENT WITH YOUR TEST RESULTS FOR

1 PA-1020-A1?

2 A YES.

3 Q SO IN CONCLUSION, BASED ON YOUR TESTING OF THE
4 THREE MMIC POWER AMPLIFIER DESIGNS FOUND ON CREE WAFER
5 BE1641-1, DID YOU REACH A CONCLUSION ABOUT THE
6 PERFORMANCE OF THOSE MMIC POWER AMPLIFIERS?

7 A YES.

8 Q AND FOR EACH OF THE THREE DESIGNS THAT WE'VE
9 DISCUSSED, WHAT WAS YOUR CONCLUSION WITH RESPECT TO
10 THEIR PERFORMANCE AS IT COMPARES TO THE ECCN PARAMETERS
11 IN EFFECT BETWEEN DECEMBER 2013 AND JANUARY 2014?

12 A THESE AMPLIFIERS EXCEED THE THRESHOLDS FOR THE ECCN
13 PARAMETERS.

14 Q AND WHAT IS YOUR OPINION AS TO WHETHER OTHER WAFERS
15 MANUFACTURED IN THAT SAME PRODUCTION RUN WOULD
16 SIMILARLY EXCEED?

17 A OTHER WAFERS WOULD SIMILARLY EXCEED.

18 MR. SHOBAKI: NO FURTHER QUESTIONS, YOUR
19 HONOR.

20 THE COURT: CROSS-EXAMINATION, MR. HANUSZ?

21 MR. HANUSZ: YOUR HONOR, IF I MAY HAVE A
22 MOMENT?

23 THE COURT: YES.

24

25

CROSS-EXAMINATION

2 BY MR. HANUSZ:

3 Q GOOD MORNING, DR. NORDQUIST.

4 A GOOD MORNING.

5 Q SO YOU RECEIVED THE CREE WAFER ON OCTOBER 4, 2018?

6 A IT'S THE DATE THAT IT'S WRITTEN IN THE REPORT. I'M
7 ASSUMING THAT'S WHAT'S WRITTEN HERE.

8 Q SO IF THAT DATE IS IN THE REPORT, THAT DATE WOULD
9 BE ACCURATE?

10 A YES.

11 Q YOU RECEIVED IT FROM AN AGENT WITH THE DEPARTMENT
12 QF JUSTICE?

13 A YES

14 Q NOW, THAT AGENT HAD RECEIVED IT FROM UGIA?

15 A THAT AGENT HAD RECEIVED IT FROM THE LOS ANGELES
16 OFFICE

17 Q BUT THE LOS ANGELES OFFICE HAD RECEIVED IT FROM
18 UGMA

10 THAT IS MY UNDERSTANDING

20 Q AND IT HAD BEEN RECOVERED FROM THE -- FROM A
21 PROFESSOR IN THE ELECTRICAL ENGINEERING DEPARTMENT AT
22 UCLA?

23 MR. SHOBAKI: OBJECTION. FOUNDATION. CALLS
24 FOR SPECULATION.

25 MR. HANUSZ: YOUR HONOR, I BELIEVE THE

1 GOVERNMENT STATED AS MUCH IN ITS OPENING YESTERDAY.

2 THE COURT: THE WITNESS MAY NOT KNOW. SO
3 ESTABLISH THE FOUNDATION, PLEASE.

4 BY MR. HANUSZ:

5 Q DO YOU KNOW WHERE THE WAFER CAME FROM IN TERMS OF
6 WHERE IT WAS RECOVERED IN LOS ANGELES?

7 A SO I WAS TOLD BY THE DEPARTMENT OF JUSTICE THAT IT
8 WAS RECOVERED FROM A PROFESSOR AT UCLA.

9 Q AND WERE YOU TOLD -- YOU WERE TOLD THAT THAT
10 PROFESSOR WAS ETHAN WANG?

11 A YES.

12 Q AND ETHAN WANG IS A TENURED PROFESSOR IN THE
13 ELECTRICAL ENGINEERING DEPARTMENT AT UCLA?

14 MR. SHOBAKI: SAME OBJECTIONS.

15 THE COURT: SUSTAINED.

16 BY MR. HANUSZ:

17 Q SO DO YOU KNOW WHO ETHAN WANG IS?

18 A YES.

19 Q WHO IS ETHAN WANG?

20 A HE'S A PROFESSOR AT UCLA.

21 Q AND DO YOU KNOW IF HE HAS TENURE OR NOT?

22 A I DO NOT KNOW FOR CERTAIN.

23 Q YOU'RE AWARE THAT HE'S PUBLISHED ARTICLES?

24 A YES.

25 Q YOU'RE AWARE THAT HE HAS SPOKEN AT CONFERENCES?

1 A YES.

2 Q AND YOU'RE AWARE THAT HE'S A SENIOR MEMBER OF THE
3 IEEE?

4 A YES.

5 Q AND YOU'RE AWARE THAT THIS WAFER HAD -- THAT
6 RESEARCH HAD BEEN DONE IN CONNECTION WITH THIS WAFER AT
7 UCLA?

8 A YES.

9 Q AND YOU'RE AWARE OF THE REPUTATION OF UCLA'S
10 ELECTRICAL ENGINEERING DEPARTMENT?

11 A YES.

12 Q IT'S ONE OF THE BEST IN THE WORLD?

13 A YES.

14 Q NOW, AFTER IT HAD BEEN RECOVERED FROM UCLA, IT WAS
15 THEN TESTED AT CREE; RIGHT?

16 A YES.

17 Q AND IT WAS TESTED BY DR. JEFFREY BARNER; RIGHT?

18 A YES.

19 Q AND HE PREPARED SOME REPORTS IN CONNECTION WITH HIS
20 TESTING?

21 A YES.

22 Q AND YOU REVIEWED THOSE REPORTS IN THE COURSE OF
23 YOUR EVALUATION?

24 A YES.

25 Q YOU RELIED ON THOSE REPORTS IN THE COURSE OF YOUR

1 EVALUATION?

2 A YES.

3 Q AND YOU'RE AWARE THAT HIS REPORTS INDICATED THAT
4 SOME OF THE MMIC'S ACTUALLY FAILED, AND THAT IT DIDN'T
5 TEST WITH THE EXPECTATION?

6 MR. SHOBAKI: OBJECTION. VAGUE.

7 THE COURT: DO YOU UNDERSTAND THE QUESTION?

8 THE WITNESS: I UNDERSTAND THE QUESTION, BUT
9 IT IS NOT A ONE WORD ANSWER. THE --

10 THE COURT: OBJECTION IS OVERRULED.

11 YOU MAY ANSWER.

12 MR. HANUSZ: IT'S ACTUALLY A "YES" OR "NO"
13 QUESTION.

14 THE COURT: WELL --

15 MR. HANUSZ: I MEAN, HE CAN EXPLAIN --

16 THE WITNESS: SO CREE, IN THEIR TEST REPORT,
17 INCLUDED DATA FROM TWO MMIC'S. IN BOTH CASES, THEY
18 CONCLUDED THAT THE POWER OUTPUT WAS NOT AS HIGH AS THEY
19 WOULD HAVE EXPECTED.

20 BY MR. HANUSZ:

21 Q SO THE TESTING THAT CREE CONDUCTED POST-MANUFACTURE
22 DID NOT MATCH THE EXPECTED OUTPUT?

23 A THAT'S CORRECT.

24 Q NOW, WHEN DR. BARNER TESTED THE WAFER, HE PICKED
25 DIE OFF THE WAFER; RIGHT?

1 A YES.

2 Q THAT'S HOW YOU TEST A WAFER. YOU HAVE -- MAY I --
3 DOES THE WITNESS HAVE THE WAFER?

4 OKAY. SO YOU HAVE INDIVIDUAL DIES ON THE
5 WAFER.

6 THE COURT: YOU'RE REFERRING TO EXHIBIT 1?

7 MR. HANUSZ: THANK YOU, YOUR HONOR. EXHIBIT
8 1.

9 BY MR. HANUSZ:

10 Q YOU PICK INDIVIDUAL DIE OFF THE WAFER; CORRECT?

11 A YES.

12 Q OKAY. AND THEN YOU PUT IT ON A MACHINE OR A NUMBER
13 OF MACHINES, AND YOU HOOK WIRES UP INTO IT; RIGHT?

14 A YES.

15 Q AND THAT'S HOW YOU DETERMINE THE PERFORMANCE?

16 A YES.

17 Q THAT'S HOW YOU DETERMINE THE ACTUAL OUTPUT, THE
18 ACTUAL PERFORMANCE OF THE MMIC?

19 A YES.

20 Q SO DR. BARNER PICKED DIE OFF THE WAFER AND TESTED
21 IT?

22 A YES.

23 Q AND THEN IT CAME TO YOU, AND YOU PICKED DIE OFF THE
24 WAFER, AND YOU TESTED IT?

25 A YES.

1 MR. HANUSZ: YOUR HONOR, AGENT STORINO IS
2 GOING TO ASSIST ME WITH THIS.

3 I WOULD LIKE TO PULL UP 5011. I'M GOING
4 TO SHOW YOU A DEMONSTRATIVE -- A PHOTOGRAPH THAT WAS
5 INCLUDED IN THE PREVIOUS DEMONSTRATIVE.

6 THE COURT: ANY OBJECTION TO THAT BEING
7 PUBLISHED, BECAUSE I DON'T --

8 MR. SHOBAKI: NO, YOUR HONOR. THERE ARE NO
9 OBJECTIONS TO THAT.

10 THE COURT: THANK YOU.

11 BY MR. HANUSZ:

12 Q SO DO YOU RECOGNIZE THIS PHOTO?

13 A YES.

14 Q AND TELL ME ABOUT -- WHO TOOK THIS PHOTO?

15 A THIS IS A PHOTO OF EXHIBIT 1 THAT WAS TAKEN AT OUR
16 PLACE, AT SANDIA, BY ME PRIOR TO REMOVING ANY PARTS
17 FROM IT.

18 Q SO YOU JUST TOOK A CAMERA, NOT A HIGH-TECH CAMERA
19 LIKE -- THEY'RE ALL HIGH-TECH AT THIS POINT, BUT YOU
20 TOOK A PICTURE OF IT?

21 A YES.

22 Q AND SO THE DIE ON THE RIGHT SIDE OF THE WAFER.

23 SOME DIE HAD BEEN PICKED?

24 A THE DIE THAT I SEE THAT --

25 Q THE LEFT SIDE OF THE WAFER OR THE RIGHT?

1 A YES.

2 Q AND THESE RECTANGULAR STRUCTURES, THOSE ARE THE
3 PCM'S; RIGHT?

4 A YES.

5 Q AND THOSE WOULD HAVE BEEN REMOVED BY THE
6 MANUFACTURER?

7 A YES.

8 Q SO WHEN THIS WAFER WAS DELIVERED, IT DID NOT
9 CONTAIN THE PCM'S?

10 A CORRECT.

11 Q BECAUSE CREE WOULD KEEP THE PCM'S; RIGHT?

12 A YES.

13 Q BECAUSE IT'S THEIR TECHNOLOGY, AND THERE'S SOME
14 INTELLECTUAL PROPERTY CONTAINED IN THE PCM'S?

15 A YES.

16 Q SO THEY DON'T EVEN GIVE THOSE TO THE CUSTOMER?

17 A GENERALLY, THEY DON'T.

18 Q BUT YOU CAN TELL WHEN YOU RECEIVE THIS WAFER THAT
19 SOME TESTING HAD BEEN DONE?

20 A YES.

21 Q OR THAT SOME DIE HAD BEEN PICKED?

22 A YES.

23 Q SO THAT'S THE WAFER -- THAT'S THE CONDITION OF THE
24 WAFER WHEN YOU RECEIVED IT.

25 MR. HANUSZ: AGENT, IF WE CAN GO TO SLIDE 12.

1 BY MR. HANUSZ:

2 Q DR. NORDQUIST, DO YOU RECOGNIZE THIS PHOTO?

3 A YES.

4 Q SO DO YOU RECOGNIZE THIS PHOTOGRAPH?

5 A YES.

6 Q AND WHAT'S THIS A PHOTOGRAPH OF?

7 A THIS IS A PHOTOGRAPH OF THE WAFER TAKEN AFTER WE
8 HAD REMOVED THE DIE FOR OUR TESTING PURPOSES.

9 Q SO THIS IS ALSO EXHIBIT 1?

10 A YES.

11 Q SO YOU REMOVED A SIGNIFICANT -- THERE'S
12 SIGNIFICANTLY MORE DIE PICKED IN THIS PHOTO THAN IN THE
13 INITIAL PHOTO?

14 A YES.

15 Q AND THOSE ARE THE DIE THAT YOU PICKED FOR TESTING?

16 A YES.

17 Q THE TESTING YOU CONDUCTED IN THIS CASE?

18 A YES.

19 Q OKAY. SO YOU PICKED AMPLIFIERS RIGHT OFF THE
20 WAFER?

21 A YES.

22 Q AND YOU PICKED SOME TEST DIE?

23 A YES.

24 Q NOW, WHEN YOU RECEIVED THE WAFER, YOU HAD SOME
25 TESTING REPORTS; RIGHT?

1 A YES.

2 Q YOU HAD DR. BARNER'S TEST REPORTS?

3 A YES.

4 Q AND YOU HAD THE WAFER ITSELF?

5 A YES.

6 Q BUT ALL THE TESTING THAT DR. BARNER HAD CONDUCTED
7 WAS CONDUCTED AFTER THE WAFER HAD BEEN MANUFACTURED;
8 RIGHT?

9 A YES.

10 Q IT HAD BEEN DONE AFTER THE WAFER HAD BEEN
11 DELIVERED?

12 A YES.

13 Q OKAY. SO YOU HAD THE WAFER, AND YOU DID A VISUAL
14 INSPECTION OF IT?

15 A YES.

16 Q RIGHT? JUST -- AND YOU TOOK A PICTURE OF IT.

17 BUT WHEN YOU LOOK AT THE WAFER, THE PHYSICAL
18 INSPECTION, YOU CAN'T TELL WHAT THOSE MMIC'S ARE FOR,
19 CAN YOU?

20 A NOT AT THIS MAGNIFICATION.

21 Q YOU CAN'T TELL WHAT THE OUTPUT IS?

22 A NOT AT THIS MAGNIFICATION.

23 Q YOU CAN'T TELL WHAT GIGAHERTZ IT'S RUNNING AT?

24 A NOT LOOKING AT IT WITH THE BARE EYE AT THIS
25 DISTANCE.

1 Q YOU CAN'T TELL THE PURPOSE OF THESE MMIC'S BY
2 LOOKING AT THEM?

3 A AGAIN, NOT TO THE BARE EYE.

4 Q BUT YOU CAN ESTIMATE THE PERFORMANCE IF YOU LOOK AT
5 THE CIRCUIT DESIGN?

6 A YES.

7 Q BUT THE ONLY WAY TO KNOW IS ACTUALLY TO TEST IT?

8 A YES.

9 Q AND YOU HAVE TO TEST IT TO DETERMINE WHETHER OR NOT
10 IT CONFORMED WITH THE EXPECTATIONS?

11 A YES.

12 Q WITH DESIGNS?

13 A YES.

14 Q SO ALL THE TESTING THAT DR. BARNER DID, ALL THE
15 TESTING THAT CREE DID WAS DONE AFTER THE WAFERS WERE
16 DELIVERED?

17 A YES.

18 Q NOW, I WANT TO TALK TO YOU ABOUT CHIP DESIGN AND
19 HOW THAT WORKS.

20 SO THERE ARE CHIP DESIGNERS; RIGHT?

21 A YES.

22 Q THEN THERE ARE CHIP MANUFACTURERS?

23 A YES.

24 Q THEY'RE TWO DIFFERENT THINGS, BUT CREE ACTUALLY
25 DOES BOTH?

1 A YES.

2 Q IF YOU WANT CREE TO DESIGN A WAFER OR A MMIC, YOU
3 CAN PAY CREE, AND THEY'LL DESIGN IT FOR YOU?

4 A YES.

5 Q OR YOU CAN USE THEM AS A MACHINE SHOP, AS A TOOL
6 SHOP; RIGHT?

7 A YES.

8 Q WHERE YOU GIVE THEM THE DESIGN, RIGHT?

9 A YES.

10 Q AND THEN YOU ASK THEM TO BUILD YOUR DESIGN,
11 ESSENTIALLY?

12 A YES.

13 Q OKAY. AND IN THIS CASE, CREE ACTUALLY RECEIVED THE
14 DESIGN?

15 A YES.

16 Q CREE DID NOT DESIGN THE MMIC'S?

17 A CORRECT, CREE DID NOT DESIGN THE MMIC.

18 Q SO CREE DIDN'T OWN THE INTELLECTUAL PROPERTY OF THE
19 DESIGNS?

20 MR. SHOBAKI: OBJECTION. CALLS FOR
21 SPECULATION AND FOUNDATION.

22 THE COURT: SUSTAINED.

23 BY MR. HANUSZ:

24 Q DO YOU KNOW IF CREE OWNED THE INTELLECTUAL PROPERTY
25 OF THE DESIGNS?

1 MR. SHOBAKI: SAME OBJECTION.

2 THE COURT: SUSTAINED.

3 CALLS FOR A LEGAL CONCLUSION.

4 BY MR. HANUSZ:

5 Q SO IN THE MACHINE SHOP ANALOGY, IF YOU DESIGN A
6 TOOL, RIGHT, YOU THEN -- BUT YOU DON'T HAVE THE ABILITY
7 TO MAKE IT, RIGHT, SO YOU SEND IT OUTSIDE TO A MACHINE
8 SHOP, RIGHT, AND THE MACHINE SHOP MANUFACTURES IT?

9 A YES.

10 Q THE MACHINE SHOP GIVES IT BACK TO YOU, RIGHT, AFTER
11 THE MANUFACTURING?

12 A YES.

13 Q AND YOU HOPE THAT IT WILL WORK ACCORDING TO YOUR
14 DESIGN; RIGHT?

15 A YES.

16 Q IT MAY NOT; RIGHT?

17 A CORRECT.

18 Q THERE MAY BE A DESIGN DEFECT OR A FLAW; RIGHT?

19 A YES.

20 Q THERE MAY BE A MANUFACTURING FLAW?

21 A YES.

22 Q AND, IN FACT, IN THE CHIP DESIGN PROCESS, MANY
23 DESIGNS FAIL, DON'T THEY?

24 A YES.

25 Q 9 OUT OF 10?

1 MR. SHOBAKI: OBJECTION. SPECULATION.

2 THE COURT: SUSTAINED.

3 BY MR. HANUSZ:

4 Q IF BASED ON YOUR -- YOU'RE A CHIP DESIGNER; RIGHT?

5 A YES.

6 Q YOU HAVE A PH.D. FROM PENN STATE?

7 A YES.

8 Q YOU WORK IN A VERY RESPECTED NATIONAL LABORATORY?

9 A YES.

10 Q YOU DESIGN MANY CHIPS?

11 A YES.

12 Q YOU HAVE SEEN DESIGNS OF CHIPS MADE BY MANY OTHER
13 SCIENTISTS?

14 A YES.

15 Q AND BASED ON YOUR EXPERIENCE, YOU WOULD AGREE THAT
16 MANY DESIGNS FAIL?

17 A I THINK THAT THE DEFINITION OF "MANY" AND "FAIL"
18 WOULD BE UP FOR DEBATE.

19 MANY DESIGNS UNDERPERFORM ON THE FIRST PASS,
20 DON'T DO EXACTLY WHAT YOU EXPECTED THEM TO DO. BUT I
21 WOULDN'T NECESSARILY SAY THAT THEY FAILED. AND THE
22 FOUNDRY DESIGN KITS ARE GOOD ENOUGH THAT, GENERALLY,
23 THERE'S AN EXPECTATION OF FIRST-PASS SUCCESS.

24 Q FAIR ENOUGH.

25 BUT IN THIS CASE, CREE'S OWN TESTING INDICATED

1 THAT THE DESIGN -- THAT THE PRODUCT DID NOT CONFORM,
2 DID NOT MEET TO THE EXPECTATION OF THE DESIGN?

3 A CREE'S TESTING CONCLUDED THAT THE POWER DENSITY ON
4 THE COMPONENT THEY TESTED WAS LOWER THAN THEY WOULD
5 HAVE EXPECTED BASED ON THE SIZE OF THE TRANSISTORS.

6 Q SO IT DIDN'T MATCH THE DESIGN?

7 A THEY DIDN'T HAVE THE DESIGN.

8 Q OKAY. SO IT DIDN'T MATCH THE EXPECTATION. IT
9 DIDN'T MATCH THE EXPECTATION OF THE PERFORMANCE OF THE
10 MMIC?

11 A THAT IS WHAT THE REPORT SAYS, YES.

12 Q NOW, THE DESIGNS ON THESE CHIPS, THEY WERE NOT MASS
13 PRODUCED BY CREE; RIGHT?

14 A THEY -- AS FAR AS I KNOW, THE FOUR WAFERS ARE THE
15 FOUR WAFERS THAT WERE MADE.

16 Q AND IT WAS A FOUR-WAFER RUN, TO YOUR KNOWLEDGE?

17 A YES.

18 Q THAT'S A TEST RUN, ISN'T IT?

19 A YES.

20 Q IT'S AN ENGINEERING RUN; RIGHT?

21 A YES.

22 Q IT'S NOT A PRODUCTION RUN?

23 A IT DEPENDS ON HOW MANY PARTS YOU NEED. BUT,
24 GENERALLY, IT WOULDN'T BE PRODUCTION IN MASS PRODUCTION
25 VOLUME.

1 Q BUT FOUR WAFERS IS CONSISTENT WITH A PROTOTYPE;
2 RIGHT?

3 A YES.

4 Q IT'S CONSISTENT WITH A TEST?

5 A YES.

6 Q TO TRY TO DETERMINE WHETHER OR NOT SOMETHING WORKS?

7 A YES.

8 Q RIGHT?

9 IT'S NOT CONSISTENT WITH IT BEING THE FINISHED
10 PRODUCT?

11 A THAT'S CORRECT.

12 Q OKAY. BUT ONCE YOU FIGURE OUT WHETHER THE
13 DESIGN -- ONCE YOU PERFECT THE DESIGN, YOU CAN THEN --
14 IF YOU PERFECT THE DESIGN, YOU CAN THEN PRODUCE ON A
15 BROADER SCALE; RIGHT?

16 MR. SHOBAKI: OBJECTION. VAGUE.

17 THE COURT: DO YOU UNDERSTAND THE QUESTION?

18 THE WITNESS: YES.

19 THE COURT: YOU MAY ANSWER.

20 THE WITNESS: YES. IF YOU WERE HAPPY WITH THE
21 DESIGN AND HAD A BUSINESS PURPOSE, YOU WOULD THEN GO
22 AND PRODUCE MORE OF THEM.

23 BY MR. HANUSZ:

24 Q AND IN A PRODUCTION RUN, THERE'S USUALLY ONE OR TWO
25 CIRCUITS; RIGHT?

1 A YES.

2 Q WHEREAS, IN AN ENGINEERING RUN, YOU MIGHT HAVE MANY
3 DIFFERENT CIRCUITS?

4 A YES.

5 Q BECAUSE YOU'RE TRYING TO FIGURE OUT WHAT WORKS AND
6 WHAT DOESN'T?

7 A YES.

8 Q NOW, YOU INDICATED THAT THE MMIC'S AT ISSUE HERE
9 WERE PRODUCED BY CREE?

10 A YES.

11 Q AND CREE IS BASED IN NORTH CAROLINA?

12 A YES.

13 Q IT IS A -- IT'S A HUGE FOUNDRY?

14 A YES.

15 Q RIGHT?

16 THEY SHIP ITEMS ALL OVER THE WORLD?

17 MR. SHOBAKI: OBJECTION. FOUNDATION. CALLS
18 FOR SPECULATION.

19 THE COURT: SUSTAINED.

20 BY MR. HANUSZ:

21 Q DO YOU KNOW IF THEY SHIP ITEMS ALL OVER THE WORLD?

22 A THEY PRODUCE MANY ITEMS FOR MANY APPLICATIONS AND
23 SHIP THEM WORLDWIDE, TO MY KNOWLEDGE.

24 Q THEY ACTUALLY MANUFACTURE PRODUCTS IN CHINA AS
25 WELL?

1 A THEY MANUFACTURE SOME PRODUCTS IN CHINA.

2 Q AND MMIC'S ARE ACTUALLY PRODUCED ALL OVER THE
3 WORLD; RIGHT?

4 A YES.

5 Q THEY'RE PRODUCED IN TAIWAN?

6 A YES.

7 Q THEY'RE PRODUCED IN THE U.S.?

8 A YES.

9 Q THEY'RE PRODUCED IN IRELAND?

10 A I CAN'T THINK OF A SPECIFIC FOUNDRY IN IRELAND, BUT
11 PROBABLY.

12 Q THEY'RE PRODUCED IN FRANCE?

13 A YES.

14 Q THEY'RE PRODUCED IN SOUTH KOREA?

15 A YES.

16 Q AND THEY'RE PRODUCED IN CHINA?

17 A AGAIN, I'M NOT AWARE OF SPECIFICS OF THE CHINESE
18 PRODUCTION, BUT PROBABLY.

19 Q BUT MMIC'S, IT'S A HUGE MARKET, RIGHT, FOR
20 MMIC'S -- FOR CHIPS?

21 A YES.

22 Q BECAUSE IN ALL OF OUR CELL PHONES, THERE ARE
23 COMPUTER CHIPS?

24 A YES, THERE ARE CHIPS IN ALL OF OUR CELL PHONES.

25 Q IN OUR I-PADS?

1 A YES.

2 Q IN OUR COMPUTERS?

3 A YES.

4 Q OKAY. IN LARGER COMMUNICATION SYSTEMS SUCH AS BASE
5 STATIONS FOR CELL PHONES?

6 A YES.

7 Q FOR DEVICES WHICH SENSE TRAIN COLLISIONS?

8 A YES.

9 Q OR WE TRY TO AVOID TRAIN COLLISIONS.

10 AND THOSE ARE ACTUALLY -- THOSE ARE AT THE
11 HIGHER FREQUENCY; RIGHT?

12 A SOME OF THEM ARE, YES.

13 Q BUT, CERTAINLY, CELL PHONE BASE STATIONS USE A
14 HIGHER FREQUENCY AND A HIGHER OUTPUT THAN -- THE MMIC'S
15 IN THOSE ITEMS HAVE A HIGHER OUTPUT THAN THE ONES IN
16 OUR CELL PHONES?

17 A YES.

18 Q SIGNIFICANTLY HIGHER?

19 A YES.

20 Q OKAY. NOW, THE TESTING YOU CONDUCTED IN THIS CASE
21 TOOK SOME TIME; RIGHT?

22 A YES.

23 Q YOU RECEIVED THE ITEMS ON OCTOBER 4, 2018?

24 A YES.

25 Q OR THE ITEM.

1 AND I THINK YOU PRODUCED YOUR REPORT ON
2 DECEMBER 14TH, 2018?

3 A THAT SOUNDS CORRECT.

4 Q SO YOU CONDUCTED TWO MONTHS OF TESTING ON THESE
5 ITEMS?

6 A YES.

7 Q OR THESE MMIC'S.

8 YOU RAN THEM THROUGH NUMEROUS -- USED NUMEROUS
9 MACHINES?

10 A YES.

11 Q THEY'RE THE MOST RECENT. THEY'RE UP TO DATE.
12 THEY'RE CALIBRATED?

13 A YES.

14 Q THEY'RE EXPENSIVE?

15 A YES.

16 Q AND AT SANDIA LABS, YOU HAVE THE BEST STUFF IN THE
17 WORLD, RIGHT, IN TERMS OF TESTING?

18 A OUR EQUIPMENT IS CONSISTENT WITH WHAT YOU WOULD
19 FIND IN THE INDUSTRY.

20 Q OKAY. AND YOU HAD VERY ESTEEMED SCIENTISTS?

21 A YES.

22 Q AND SANDIA IS NOT -- ACTUALLY, IT'S RUN BY AND IS
23 OWNED AND MANAGED BY HONEYWELL; RIGHT?

24 A SANDIA IS A FEDERALLY-FUNDED CORPORATION THAT IS
25 MANAGED -- THE MANAGEMENT CONTRACT IS WITH ENTICE

1 CORPORATION, WHICH IS A SUBSIDIARY OF HONEYWELL.

2 Q SO HONEYWELL ULTIMATELY RUNS AND MANAGES SANDIA?

3 A HONEYWELL ADMINISTERS THE CONTRACT THROUGH ITS
4 SUBSIDIARY --

5 Q SO I WANT TO TALK TO YOU A LITTLE BIT ABOUT WHAT
6 "RATED" MEANS, WHEN AN ITEM IS RATED.

7 ARE YOU FAMILIAR WITH THAT TERM?

8 A YES.

9 Q SO "RATED" MEANS -- TO A SCIENTIST, "RATED"
10 ACTUALLY MEANS SOMETHING?

11 A YES.

12 Q IT MEANS IT'S BEEN TESTED?

13 A YES.

14 Q IT'S BEEN -- THE QUALITY HAS BEEN DETERMINED?

15 A YES.

16 Q IT'S GONE THROUGH A BATTERY OF TESTS; RIGHT?

17 A YES.

18 Q SO YOU CAN RELY -- WE KNOW THAT WHEN SOMETHING HAS
19 BEEN RATED, WE KNOW THAT IT WILL PERFORM IN CONJUNCTION
20 OR IT WILL PERFORM ACCORDING TO THAT RATING?

21 A YES.

22 Q NOW, THESE CHIPS WEREN'T RATED, WERE THEY?

23 A THERE WAS OTHER -- OTHER THAN THE DESIGN
24 DOCUMENTATION WE TALKED ABOUT EARLIER, THEY HAVE NOT
25 BEEN RATED IN ANY MEANINGFUL WAY.

1 Q OKAY. SO I THINK YOU SAID ON -- INITIALLY THAT YOU
2 WERE A MEMBER OF THE IEEE?

3 A YES.

4 Q AND YOU'RE A SENIOR MEMBER OF THE IEEE?

5 A YES.

6 Q AND DO YOU KNOW IF DR. SHIH IS A SENIOR MEMBER OF
7 THE IEEE?

8 A I KNOW HE'S A MEMBER OF THE IEEE. I DON'T RECALL
9 HIS MEMBERSHIP GRADE.

10 Q OKAY. AND THIS IS THE GOVERNING -- THE IEEE IS THE
11 GOVERNING BODY FOR ELECTRICAL ENGINEERS?

12 A YES.

13 Q IT'S THE GOLD STANDARD?

14 A YES.

15 Q IF YOU'RE A MEMBER OF THE IEEE, YOU'RE LEGIT?

16 A YES.

17 Q OKAY. AND YOU HAVE TO BE -- I CAN'T BECOME A
18 MEMBER OF THE IEEE; RIGHT?

19 MR. SHOBAKI: OBJECTION. SPECULATION.

20 BY MR. HANUSZ:

21 Q SOMEONE WHO IS NOT AN ENGINEER, SUCH AS A LAWYER,
22 CAN'T BECOME A MEMBER OF IEEE; RIGHT?

23 A I DON'T RECALL THE SPECIFICS FOR AFFILIATED
24 MEMBERSHIP, BUT IT WOULDN'T BE NORMAL.

25 Q OKAY. BUT YOU HAVE TO APPLY; CORRECT?

1 A YES.

2 Q OKAY. AND THEN TO BECOME A SENIOR MEMBER, THERE IS
3 ANOTHER APPLICATION PROCESS FOR THAT?

4 A YES.

5 Q IT'S KIND OF AN HONOR SOCIETY?

6 A YES.

7 Q IT'S VERY SELECTIVE?

8 A YES.

9 Q AND THE SENIOR MEMBERS ARE THE CREME DE LA CREME OF
10 THE IEEE?

11 A THERE'S ANOTHER GRADE CALLED FELLOW. BUT THE
12 SENIOR MEMBERS ARE RESPECTED MEMBERS OF THE IEEE.

13 Q ARE THE SENIOR MEMBERS HIGHER THAN THE FELLOWS?

14 A NO. THE FELLOWS ARE HIGHER THAN THE SENIOR
15 MEMBERS.

16 Q OKAY. AND THE IEEE PUBLISHES VARIOUS JOURNALS?

17 A YES.

18 Q AND YOU HAVE PUBLISHED -- YOU YOURSELF ALSO HAVE
19 PUBLISHED IN MANY OF THOSE JOURNALS?

20 A YES.

21 Q AND YOU ACTUALLY HAVE SERVED ON A PEER REVIEW
22 PANEL; CORRECT?

23 A YES.

24 Q SO JUST BECAUSE SOMEONE SUBMITS AN ARTICLE TO A
25 JOURNAL FOR PUBLICATION, DOESN'T MEAN IT'S GOING TO GET

1 PUBLISHED, DOES IT?

2 A THAT'S CORRECT.

3 Q IT GETS REVIEWED BY A TEAM OF SCIENTISTS; RIGHT?

4 A YES.

5 Q TO DETERMINE WHETHER OR NOT IT'S WORTHY OF
6 PUBLICATION?

7 A THAT'S CORRECT.

8 Q AND PART OF THAT IS DETERMINING WHETHER OR NOT IT
9 ADVANCES THE SCIENCE?

10 A YES.

11 Q AND ADVANCES OUR UNDERSTANDING OF SCIENCE?

12 A YES.

13 Q AND IT'S PRESTIGIOUS TO PUBLISH?

14 MR. SHOBAKI: YOUR HONOR, OBJECTION TO THE
15 RELEVANCE OF THIS LINE AND ALSO THE SCOPE. IT'S FAR
16 BEYOND THE LIMITED SUBJECT MATTER.

17 THE COURT: LET'S MOVE ON, PLEASE.

18 MR. HANUSZ: YOUR HONOR, IF I MAY HAVE A
19 MOMENT?

20 YOUR HONOR, IF IT'S A SCOPE ISSUE, WE CAN
21 CALL DR. NORDQUIST BACK. I'M ALMOST DONE WITH
22 CROSS-EXAMINATION, BUT I THINK IT'S CERTAINLY RELEVANT
23 TO THE INTRODUCTION.

24 THE COURT: OKAY. I THINK -- LET'S MOVE ON,
25 PLEASE.

1 MR. HANUSZ: OKAY. WELL, I WANT TO TALK TO
2 HIM A LITTLE BIT ABOUT HIS PUBLICATIONS.

3 THE COURT: THAT'S FINE.

4 BY MR. HANUSZ:

5 Q SO YOU'RE A REVIEWER FOR NUMEROUS JOURNALS?

6 A YES.

7 Q ONE OF THOSE IS ELECTRONICS LETTERS?

8 A YES.

9 Q THAT'S NOT PUBLISHED BY THE IEEE?

10 A THAT IS CORRECT.

11 Q BUT IT'S ANOTHER PEER-REVIEWED JOURNAL?

12 A YES.

13 Q YOU'RE ALSO A REVIEWER FOR THE IEEE -- FOR THE
14 JOURNAL IEEE TRANSACTIONS ON ELECTRONIC DEVICES?

15 A YES.

16 Q IEEE JOURNAL OF MICROWAVE AND WIRELESS COMPONENT
17 LETTERS?

18 A YES.

19 Q OKAY. AND YOU HAVE PUBLISHED 35 JOURNAL ARTICLES?

20 A APPROXIMATELY THAT, YES.

21 Q MORE OR LESS.

22 AND THAT'S IN THE IEEE ELECTRONIC DEVICE
23 LETTERS?

24 A AS WELL AS --

25 Q WELL, I'LL GO THROUGH IT.

1 BUT IEEE TRANSACTIONS ON COMPONENTS PACKING
2 AND MANUFACTURING TECHNOLOGY?

3 A YES.

4 Q THE IEEE ASME JOURNAL OF MICROELECTRICAL MECHANICAL
5 SYSTEMS?

6 A YES.

7 Q THE IEEE JOURNAL OF SELECTED TOPICS IN QUANTUM
8 ELECTRONICS?

9 A YES.

10 Q THE IEEE MICROWAVE AND WIRELESS COMPONENT LETTERS?

11 A YES.

12 Q OKAY. I'D LIKE YOU TO LOOK AT THE EXHIBIT BINDERS
13 BEHIND YOU. I'M GOING TO ASK YOU TO LOOK AT SOME
14 EXHIBITS.

15 A OKAY.

16 Q STARTING WITH 3201.

17 YOU'LL SEE ON THE OUTSIDE OF THE BINDERS,
18 THERE'S A VOLUME, SO 3201.

19 A OKAY.

20 Q AND JUST TO BE CLEAR, A COUPLE WEEKS AGO, THE
21 GOVERNMENT ACTUALLY REVIEWED ITEMS WITH YOU THAT HAD
22 BEEN GIVEN TO THE GOVERNMENT BY THE DEFENSE; RIGHT?

23 A YES.

24 Q OKAY. AND SOME OF THOSE ITEMS WERE JOURNAL
25 ARTICLES?

1 A YES.

2 Q AND PATENTS?

3 A YES.

4 Q OKAY. SO I'D LIKE YOU TO LOOK AT EXHIBIT NUMBER
5 3201.

6 A OKAY.

7 MR. HANUSZ: AND, YOUR HONOR, I CAN KIND OF DO
8 THESE IN A SERIES, IF THAT'S EASIER.

9 BY MR. HANUSZ:

10 Q IF YOU COULD LOOK AT 3201 AND JUST -- IF YOU DON'T
11 RECOGNIZE IT, TELL ME. OKAY?

12 3201, 3202.

13 A OKAY.

14 Q 3204.

15 THE COURT: YOU SKIPPED 3203; IS THAT RIGHT?

16 MR. HANUSZ: I DID. I'LL COME BACK TO 3203
17 THOUGH.

18 THE WITNESS: OKAY.

19 BY MR. HANUSZ:

20 Q 3205.

21 A OKAY.

22 Q 3209.

23 A OKAY.

24 Q 3210.

25 MR. HANUSZ: YOUR HONOR, I HAVE ABOUT MAYBE 50

1 OF THESE. IT MAY BE EASIER FOR THE JURY AND
2 DR. NORDQUIST IF WE TAKE A BREAK. AND I'LL GIVE HIM
3 THE NUMBERS TO REVIEW, IF HE WANTS TO REVIEW THEM
4 DURING A BREAK. I'M CONSCIOUS OF NOT WASTING THE
5 COURT'S OR THE JURY'S TIME.

6 MR. SHOBAKI: THE GOVERNMENT HAS A GENERAL
7 OBJECTION ABOUT THE RELEVANCE OR WHERE THIS LINE OF
8 QUESTIONING IS GOING.

9 THE COURT: WHAT ARE THE OTHER EXHIBIT
10 NUMBERS, PLEASE?

11 MR. HANUSZ: ALL RIGHT. SO I THINK WE STOPPED
12 AT 3213, 3210, 3213, 3215, 3216, 3219, 3222, 3223,
13 3224, 3227, 3228, 3229, 3230.

14 AND THEN WE'RE MOVING TO ANOTHER BINDER,
15 VOLUME 7.

16 SO IN THAT VOLUME, THE RANGE WOULD BE
17 3341 TO 3350.

18 THE COURT: OKAY.

19 MR. HANUSZ: IT'LL BE ALL THE ITEMS IN THAT
20 BINDER.

21 TURNING TO VOLUME 8, THE RANGE WOULD BE
22 3351 THROUGH 3356.

23 MR. SHOBAKI: YOUR HONOR, I BELIEVE THE RANGES
24 THAT ARE IN THE BINDERS MAY BE DIFFERENT.

25 MR. HANUSZ: YOUR HONOR, IN BINDER VOLUME 8,

1 SO THE NUMBERS IN THAT VOLUME WOULD BE -- FOR THIS
2 WITNESS WOULD BE 3351 THROUGH 3356.

3 AND THEN WE WOULD GO TO 3359 TO 3383.

4 THERE ARE A COUPLE OF ADDITIONAL
5 ARTICLES. THEY'RE 3203, 3207 AND 3208. THOSE ARE FROM
6 A DIFFERENT JOURNAL, ELECTRONICS LETTERS.

7 THE COURT: OKAY. THOSE ARE IN VOLUME 3;
8 CORRECT?

9 MR. HANUSZ: YES, YOUR HONOR.

10 THE COURT: OTHER THAN THE QUESTIONS
11 CONCERNING THESE EXHIBITS, DO YOU HAVE ANY FURTHER
12 QUESTIONS FOR THE WITNESS?

13 MR. HANUSZ: I WANTED HIM TO REVIEW EXHIBIT
14 3200 AS WELL, WHICH I BELIEVE WAS PROVIDED TO HIM IN
15 THE COURSE OF HIS REVIEW.

16 THE COURT: OKAY.

17 MR. SHOBAKI: YOUR HONOR, I'M GOING TO OBJECT
18 IN THAT THERE'S A LAUNDRY LIST OF EXHIBITS HERE THAT
19 THEY'RE ASKING THE DEFENDANT TO REVIEW AND OPINE ON.

20 MR. HANUSZ: I'M ASKING HIM TO REVIEW THEM.

21 THE COURT: JUST A MINUTE.

22 THE OTHER WAS 3200; IS THAT CORRECT?

23 MR. HANUSZ: YES, YOUR HONOR.

24 THE COURT: OKAY.

25 MR. HANUSZ: THAT'S ALSO IN VOLUME 3.

1 THE COURT: OTHER THAN THE QUESTIONS
2 CONCERNING THESE EXHIBITS, DO YOU HAVE ANY OTHER
3 QUESTIONS OF THE WITNESS?

4 MR. HANUSZ: I DON'T, YOUR HONOR.

5 THE COURT: OKAY. LADIES AND GENTLEMEN, WE'RE
6 GOING TO TAKE A BREAK. WE'RE GOING TO GIVE YOU A BREAK
7 HERE.

8 PLEASE DON'T DISCUSS THE CASE DURING THE
9 BREAK. AND WHEN WE ARE FINISHED, WE'LL COME BACK AND
10 GET YOU. THANK YOU.

11 THE CLERK: ALL RISE.

12 **(THE FOLLOWING PROCEEDINGS WERE HELD IN**
13 **OPEN COURT OUTSIDE THE PRESENCE OF THE JURY:)**

14 THE COURT: PLEASE BE SEATED.

15 MR. NORDQUIST, YOU CAN STEP DOWN FOR NOW
16 PLEASE. THANK YOU.

17 MR. HANUSZ, WHAT IS THE -- I HAVE ONLY
18 LOOKED AT A FEW -- AT THE FIRST SEVERAL THAT YOU
19 IDENTIFIED. AND I SEE -- I RECOGNIZE SOME OF THE NAMES
20 AS AUTHORS.

21 WHAT'S THE RELEVANCE OF THE OFFER AND WHY
22 IS IT SOMETHING WITHIN THE REALM OF THE EXPERT
23 TESTIMONY OF THIS WITNESS?

24 MR. HANUSZ: SO A COUPLE OF THINGS, YOUR
25 HONOR. FIRST OF ALL, ALL OF THE ARTICLES REFERENCED

1 HEREIN WERE WRITTEN BY DR. SHIH, DR. ISHIANG SHIH OR
2 OTHER INDIVIDUALS WHO HAVE BEEN CHARGED IN THIS CASE.

3 DR. NORDQUIST TESTIFIED THAT HE BOTH
4 PUBLISHES IN THESE JOURNALS AND THAT HE SERVES AS A
5 PEER-REVIEWER FOR THESE JOURNALS.

6 THEY'RE NOT BEING OFFERED FOR THE TRUTH
7 OF THE MATTER ASSERTED, YOUR HONOR.

8 THEY ARE BEING OFFERED TO SHOW THAT
9 DR. SHIH AND -- DR. ISHIANG SHIH AND YI-CHI SHIH, AS
10 WELL AS THE OTHER CHARGED DEFENDANTS ARE SCIENTISTS AND
11 ARE RESEARCHERS.

12 AND HE IS A SENIOR MEMBER. HE'S REVIEWED
13 ALL THESE DOCUMENTS. HE HAS FORMED -- THEY WERE GIVEN
14 TO THE GOVERNMENT BY THE DEFENSE IN DISCOVERY. THEY
15 WERE THEN TURNED OVER TO THE EXPERT. HE'S REVIEWED
16 THESE DOCUMENTS IN THE COURSE OF HIS EVALUATION.

17 THE COURT: WHEN WERE THEY PROVIDED?

18 MR. HANUSZ: TWO OR THREE WEEKS AGO WHEN THE
19 COURT ORDERED DISCOVERY TO BE PRODUCED. AND THEN THEY
20 WERE PRODUCED TO DR. NORDQUIST ON APRIL 14TH OR APRIL
21 15TH.

22 I'M NOT ASKING HIM TO OFFER AN OPINION ON
23 THE SCIENCE CONTAINED IN ANY OF THE ARTICLES, BUT IT
24 CERTAINLY GOES TO HIS OPINIONS. IT GOES TO HIS
25 EXPERIENCE. AND IT GOES TO THE FACT THAT DR. SHIH IS A

1 RESEARCHER AND A PUBLISHER.

2 MR. SHOBAKI: YOUR HONOR, A COUPLE OF POINTS
3 ON THIS.

4 FIRST OF ALL, THE DEFENSE ASSERTS THAT
5 DR. NORDQUIST HAS REVIEWED ALL THESE DOCUMENTS. HE CAN
6 BE ASKED THAT QUESTION ON THE STAND. BUT I WOULD
7 PROFFER THAT HE HAS NOT READ THROUGH ALL THESE
8 ARTICLES.

9 WE DID PRODUCE A 302 THAT SAID HE LOOKED
10 AT SOME OF THE MATERIALS. HE'S GLANCED AT THEM. WE
11 GOT A GIANT STACK OF PRINTED STUFF FROM THE DEFENSE.

12 YOU KNOW, AS TO THE QUESTION OF WHETHER
13 THESE INFORMED HIS OPINIONS, GIVEN THAT HE DIDN'T READ
14 THESE THINGS, AND HE PUBLISHED HIS REPORT MANY, MANY
15 MONTHS BEFORE THIS, AGAIN, THAT'S AN INTERESTING
16 QUESTION.

17 MR. HANUSZ: I DON'T MEAN TO INTERRUPT, BUT IF
18 COUNSEL IS GOING TO MAKE REPRESENTATIONS ABOUT WHAT
19 DR. NORDQUIST DID OR -- I DON'T THINK HE SHOULD BE HERE
20 FOR THIS DISCUSSION.

21 THE COURT: JUST A MINUTE.

22 MR. SHOBAKI: STEPPING BACK FROM THAT. IT'S
23 NOT CLEAR WHAT THE DEFENSE INTENDS TO DO HERE. DO THEY
24 INTEND TO TRY AND AUTHENTICATE THESE DOCUMENTS BECAUSE
25 HE HAPPENS TO BE A PEER-REVIEWER DURING SOME PERIOD OF

1 TIME WITH IEEE. THESE DOCUMENTS SPAN YEARS. I HAVEN'T
2 EVEN LOOKED AT ALL OF THEM.

3 THE COURT: MR. HANUSZ, ARE YOU SEEKING TO
4 CROSS-EXAMINE THE WITNESS WITH RESPECT TO THESE
5 DOCUMENTS INSOFAR AS THEY RELATE TO THE OPINIONS HE'S
6 PROVIDED?

7 MR. HANUSZ: NO.

8 THE COURT: OKAY. ARE YOU SEEKING TO EXAMINE
9 HIM WITH RESPECT TO THE PUBLICATIONS THAT -- THE
10 ARTICLES THAT ARE PUBLISHED IN PUBLICATIONS OF THE
11 IEEE?

12 MR. HANUSZ: I THINK HE TESTIFIED THAT
13 ARTICLES --

14 THE COURT: THAT WASN'T MY QUESTION.

15 MR. HANUSZ: I DON'T UNDERSTAND THE QUESTION.

16 THE COURT: I'M TRYING TO UNDERSTAND WHAT IT
17 IS YOU'RE SEEKING TO GET THROUGH HIS EXPERT TESTIMONY
18 WITH RESPECT TO THESE EXHIBITS.

19 IS IT THAT YOU WANT TO ESTABLISH -- TO
20 THE EXTENT HIS MEMBERSHIP IN THE IEEE THAT MAY HAVE
21 PUBLISHED OR APPROVED THE PUBLICATION OF SOME OF THEM
22 BEARS ON -- IS -- IS THAT WHAT YOU'RE ASKING?

23 MR. HANUSZ: I THINK THE FACT -- HE IS AN
24 EXPERT. THE GOVERNMENT NOTICED HIM AS AN EXPERT. WE
25 HAVEN'T CHALLENGED HIM AS AN EXPERT. HE'S CLEARLY AN

1 EXPERT IN CHIP DESIGN. HE -- THERE ARE A NUMBER OF
2 THINGS -- MAY I HAVE A SECOND, YOUR HONOR?

3 YOUR HONOR, WE ASKED HIM TO LOOK AT THESE
4 ITEMS. HE HASN'T -- APPARENTLY, HE HASN'T LOOKED AT
5 SOME OF THEM YET, BUT HE CAN REVIEW THEM AND DETERMINE
6 OR NOT, AS A PUBLISHER, AS A PEER-REVIEWER, AS A
7 SCIENTIST, WHETHER OR NOT THESE PUBLICATIONS ARE
8 AUTHENTIC. THE GOVERNMENT, I DON'T THINK, HAS ANY REAL
9 QUESTION AS TO AUTHENTICITY HERE.

10 THE COURT: IS THERE AN ISSUE ABOUT THE
11 AUTHENTICITY OF THE PUBLICATION WITH RESPECT TO THE
12 DOCTORAL THESIS AS A SEPARATE ISSUE?

13 MR. SHOBAKI: YOUR HONOR, NOT HAVING LOOKED
14 THROUGH ALL OF THESE, I MEAN, SOME OF THEM ARE -- THEY
15 LOOK LIKE THEY'RE MOSTLY JOURNAL ARTICLES. AGAIN, IT'S
16 JUST -- THIS ISN'T THE WITNESS WHO PROPERLY IS USED TO
17 AUTHENTICATE AND BRING IN DEFENSE PAPERS THAT HE'S NOT
18 GOING TO OFFER ANY TESTIMONY ABOUT.

19 HE CAN CLEARLY BE CROSS-EXAMINED, IF
20 THERE'S SOMETHING TO EXAMINE HIM ABOUT ON ONE OF THESE
21 THINGS.

22 MR. HANUSZ: YOUR HONOR, I HAVE NO --

23 THE COURT: JUST A MINUTE, PLEASE.

24 MR. HANUSZ, TO THE EXTENT THAT THESE
25 EXHIBITS INCLUDE ONES THAT WERE PEER REVIEWED BY IEEE

1 OR PUBLISHED THROUGH AN IEEE PUBLICATION, THEN I THINK
2 YOU CAN ASK HIM THOSE FOCUSED QUESTIONS.

3 BUT TO THE EXTENT YOU'RE SEEKING TO DO
4 MORE THAN THAT, I THINK IT GOES BEYOND THE SCOPE OF HIS
5 EXPERT TESTIMONY, WHICH IS CONCERNING THE TESTING THAT
6 HE DID WITH RESPECT TO SPECIFIC ITEMS HERE.

7 TO THE EXTENT THAT ANY OF THE ARTICLES
8 BEARS ON THE TESTING THAT HE DID, THAT'S A DIFFERENT
9 QUESTION.

10 BUT I -- AM I CORRECT THAT YOU'RE SEEKING
11 TO INTRODUCE IT FOR A DIFFERENT PURPOSE?

12 MR. HANUSZ: YES.

13 ALL THE DOCUMENTS, ALL THE ARTICLES
14 IDENTIFIED WITH THE EXCEPTION OF THE LAST THREE, ARE
15 ALL FROM IEEE JOURNALS.

16 THE LAST THREE COME FROM ELECTRONIC
17 LETTERS, WHICH IS A JOURNAL THAT DR. NORDQUIST SITS ON
18 THE BOARD OF.

19 I ACTUALLY DON'T HAVE ANY ADDITIONAL
20 QUESTIONS FOR DR. NORDQUIST ABOUT THESE DOCUMENTS. IF
21 YOUR HONOR WOULD MOVE THEM INTO EVIDENCE, WE DON'T --
22 BUT -- WE WOULD SEEK TO ADMIT THEM. BUT I DON'T HAVE
23 ANY ADDITIONAL QUESTIONS, ASSUMING THERE'S NO QUESTION
24 OF AUTHENTICITY. BUT IF THAT'S AN ISSUE, THEN HE
25 SHOULD REVIEW THEM.

1 MR. SHOBAKI: YOUR HONOR, IT'S JUST -- THERE'S
2 BEEN NO SHOWING OF RELEVANCE HERE. THE ONLY REAL
3 RELEVANCE HERE BY THESE SHOW THAT DR. SHIH IS A
4 RESEARCHER AND A PUBLISHER. I MEAN, THIS IS JUST A
5 DUMP TRUCK OF DOCUMENTS --

6 THE COURT: ALL RIGHT. IF YOU COULD NOT -- IF
7 YOU COULD SIMPLY USE PROFESSIONAL WORDS, NOT LIKE THE
8 LAST ONE, I WOULD APPRECIATE IT.

9 IF YOU WANT TO ASK FURTHER QUESTIONS OF
10 THE WITNESS CONCERNING THE PEER-REVIEW PROCESS -- SOME
11 OF THAT'S BEEN COVERED. BUT IF YOU WANT TO ASK MORE
12 QUESTIONS ABOUT THE PEER-REVIEW PROCESS THAT'S APPLIES
13 WITH RESPECT TO THE PUBLICATION OF ARTICLES IN EITHER
14 OF BOTH OF THESE JOURNALS, YOU CAN DO THAT.

TO THE EXTENT THAT -- THAT'S FINE.

16 TO THE EXTENT -- AS TO THE ADMISSIBILITY
17 OF THESE -- I DON'T THINK AUTHENTICITY IS AT ISSUE.
18 IT'S THE ISSUE OF RELEVANCE AND OTHER ISSUES.

19 I'LL RESERVE THAT ISSUE. I DON'T THINK

20 WE NEED TO RESOLVE THAT RIGHT NOW.

21 MR. HANOSZ. YOUR HONOR, IF I MAY HAVE JUST A
22 MOMENT?

23 (PAUSE IN THE PROCEEDINGS)

24 MR. HANUSZ: YOUR HONOR, IF THERE ARE ANY
25 ISSUES AS TO AUTHENTICATION OR FOUNDATION, THIS IS THE

1 WITNESS WE WOULD CALL FOR THOSE PURPOSES.

2 SO WE MAY -- IF WE CROSS THAT BRIDGE, I
3 WOULD ALSO SAY, YOUR HONOR -- AND I CAN ADD NOW THAT A
4 NUMBER OF THESE DOCUMENTS FALL UNDER THE HEARSAY
5 EXCEPTION OF THE ANCIENT DOCUMENT EXCEPTION BECAUSE
6 THEY'RE MORE THAN 20 YEARS OLD. I'M JUST PUTTING THAT
7 OUT THERE, YOUR HONOR.

8 THE COURT: I'M TRYING TO BE EFFICIENT HERE.

9 MR. HANUSZ: UNDERSTOOD.

10 THE COURT: WHAT I'M SAYING IS, YOU CAN ASK
11 THE WITNESS QUESTIONS ABOUT THE PEER-REVIEW PROCESS.
12 AND YOU CAN ASK HIM TO REVIEW A HANDFUL OF THESE
13 ARTICLES, AS EXAMPLES, BECAUSE I DON'T THINK THEIR
14 AUTHENTICITY --

15 MR. SHOBAKI: YOUR HONOR, THE GOVERNMENT WOULD
16 CONTEST THAT THESE -- THEY APPEAR TO BE AUTHENTIC
17 COPIES OF ARTICLES FROM IEEE JOURNALS, BUT IT DOES --
18 IT GOES TO THE RELEVANCE, THE POTENTIAL FOR
19 CONFUSION --

20 THE COURT: WELL -- ALL RIGHT. I MEAN, AS I
21 SAID, THAT ISSUE CAN BE RESERVED.

22 DO YOU WISH TO ASK THOSE QUESTIONS THAT
23 I'VE IDENTIFIED?

24 MR. HANUSZ: IF THERE'S NO CHALLENGE TO
25 AUTHENTICITY, I DON'T THINK WE WOULD HAVE ANY MORE

1 QUESTIONS FOR DR. NORDQUIST.

2 THE COURT: THAT'S FINE.

3 IF, WHEN WE RETURN, YOU WISH TO ASK HIM

4 FURTHER QUESTIONS ON THE NARROW AREA, THAT'S FINE.

5 BUT, ESSENTIALLY, WHAT I'M SAYING IS THAT, I THINK
6 THERE ARE ABOUT -- THERE ARE ABOUT 50.

7 MR. HANUSZ: SOMETHING LIKE THAT. I DIDN'T DO
8 A TOTAL COUNT. I'M HAPPY TO RIGHT NOW, YOUR HONOR.

9 THE COURT: IN ANY EVENT, WITH RESPECT TO THE
10 EXHIBITS THAT WERE IDENTIFIED ON THE RECORD PRIOR TO
11 THE -- HAVING THE JURY STEP OUT, WHICH STARTED AT 3201
12 AND WENT IN -- FIRST IN THE RANGE OF 3201 TO 3230, THEN
13 IN THE RANGE OF 3341 TO 3350, THEN 3351 TO 3356, THEN
14 3359 TO 3383, AND THEN 3203, 3207 AND 3208 AND 3200,
15 I'M GOING TO RESERVE RULING ON ADMISSIBILITY OF SOME OR
16 ALL OF THEM ON RELEVANCE ISSUES, NOT AUTHENTICITY.

17 TO THE EXTENT THAT DEFENSE WISHES TO
18 QUESTION THE WITNESS FURTHER ON THE PROCESS PURSUANT TO
19 WHICH ARTICLES ARE PEER-REVIEWED FOR PUBLICATION IN
20 PUBLICATIONS WITH WHICH HE HAS FAMILIARITY ON THAT
21 PROCESS, YOU MAY DO THAT.

22 MR. HANUSZ: THANK YOU, YOUR HONOR.

23 THE COURT: ALL OF THESE EXHIBITS ARE
24 IDENTIFIED AS EXHIBITS. AND THE ISSUE -- THEIR
25 ADMISSION HAS BEEN -- THE DEFENDANT HAS MOVED TO ADMIT

1 THEM. THE GOVERNMENT HAS OBJECTED. AND I'M RESERVING
2 A RULING ON THAT BECAUSE I DON'T THINK -- BECAUSE I'LL
3 BE IN A -- BETTER ABLE TO DO THAT IN THE CONTEXT. IT'S
4 ALSO POSSIBLE THAT, IN YOUR DISCUSSIONS, YOU MAY
5 RESOLVE THIS IN SOME FASHION.

6 MR. HANUSZ: THANK YOU, YOUR HONOR.

7 THE COURT: THANK YOU.

8 WE'LL RESUME IN 15 MINUTES.

9 DOES THAT GIVE YOU ENOUGH TIME?

10 MR. HANUSZ: YES, YOUR HONOR.

11 MR. SHOBAKI: THANK YOU.

12 **(RECESS)**

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CERTIFICATE OF OFFICIAL REPORTER

COUNTY OF LOS ANGELES)
STATE OF CALIFORNIA)

I, ALEXANDER T. JOKO, FEDERAL OFFICIAL
COURT REPORTER, IN AND FOR THE UNITED STATES DISTRICT
COURT FOR THE CENTRAL DISTRICT OF CALIFORNIA, DO HEREBY
CERTIFY THAT PURSUANT TO SECTION 753, TITLE 28, UNITED
STATES CODE, THAT THE FOREGOING IS A TRUE AND CORRECT
TRANSCRIPT OF THE STENOGRAPHICALLY REPORTED PROCEEDINGS
HELD IN THE ABOVE-ENTITLED MATTER, AND THAT THE
TRANSCRIPT PAGE FORMAT IS IN CONFORMANCE WITH THE
REGULATIONS OF THE JUDICIAL CONFERENCE OF THE UNITED
STATES.

DATE: AUGUST 17, 2019

/S/ ALEXANDER B. T. JOKO

ALEXANDER T. JOKO, CSR NO. 12272
FEDERAL OFFICIAL COURT REPORTER